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[OFFICIAL NOTICE.]

Semi-Annual Meeting of the New England Association.

The semi-annual meeting of the New England Association of Gas Engineers will be held on Wednesday and Thursday, July 25 and 26, 1888, at Point of Pines, near Boston.

The members of the Association and their friends will please notice the change in the place of holding the meeting from that given in the JOURNAL of July 2d. This change has but recently been decided on, and in consequence no definite arrangements can be given at the present time.

A letter will be sent to the members within a few days, giving details so far as practicable.

A short business meeting will be held on Wednesday, July 25, at 11 A.M.

CHAS. H. NETTLETON, Sec.

BRIEFLY TOLD.

THE LESSON OF THE HALF YEAR.—Whether or not the tariff shall be revised is returned by the politicians—and, for that matter, by the people, too—as the burning question of the day; and while we are obliged to admit that vast interest has been aroused by the discussion, we nevertheless submit that another burning question is ever prominent in the minds of those interested in the gas business, either as manufacturers or consumers. This burning question is as to the progress and stability of our industry. Well, it must be said that the rate of progress made in the half year just closed was at once gratifying and astonishing. The faint-hearted of a year ago are the stout-hearted of to-day, and the change in their condition has been wrought simply through the conviction formed from the digestion of cold facts and figures. On all sides we are confronted with bustling evidence of the desire to refurbish, improve and enlarge gas plants, some of which were supposed five years ago to have been then placed in a position to meet every possible demand which could be made on their resources for at least a decade. Cheap gas, efficient service and courteous treatment of consumers are the talismans that are responsible for this pleasing condition of affairs, and having proved their worth in the past, they can and will be relied on to accomplish similar effects in the future. One exceptionally gratifying feature of this season's gas trade is the abnormal increase in day consumption, brought about by low prices and intelligent, well-directed effort to teach the people the value and comfort of gas as a domestic agent. This assertion applies to almost every city, town or village in this country in which a gas plant is operated. There can only be one verdict in respect of the results secured in the gas business in the first half of '88—and that is all in favor of the gas maker.

BACK AGAIN TO GAS.—A correspondent in Detroit, Michigan, writes that when the Brush Electric Light Company was awarded the contract for lighting the city streets and Municipal offices, some gas jets, including those in the chandeliers in the Council Chamber, were still used in the City Hall. Not wishing to pay gas bills, the Brush Company contracted with the accumulator or storage Company to put incandescent lamps in the offices and corridors of the City Hall. When this had been done the Brush Company ordered the Detroit Gas Company to remove

its meter, and the order was obeyed. The incandescent lights, however, supplied a very poor style of illumination, and the Aldermen objected. The Company was ordered to increase the efficiency of its service, but the latter went on from bad to worse. In fact the janitors complained that during the early morning hours the lamps were little better than red wires, and the engineers said the light was not strong enough to enable them to read the figures on the steam gauges. On the 3d of July the Aldermen passed a resolution directing the Brush Company to replace the gas meter. This having been attended to, the public building is once again properly illuminated.

Mr. G. Shepard Page's Impressions of His Recent European Trip.

To the Editor AMERICAN GAS LIGHT JOURNAL:

Your readers may be interested to know somewhat more concerning gas matters and men in Great Britain, and the proceedings of the Gas Institute, than will be found in your regular reports thereof. As I was enabled to be present at the late annual meeting of the Institute, and, by invitation of the Managers, subsequently visited several gas works in Great Britain and Ireland, permit me to occupy some of your space in telling about what I saw.

A letter, received just as I was about to sail for England last May, from Mr. Wm. King, the distinguished chief Engineer of the United Gas Light Company, of Liverpool, and First Vice-President of the Gas Institute, cordially invited me to visit him upon my arrival. I found him the same agreeable and courteous gentleman whose acquaintance I formed in 1870, ready to impart information upon any department of gas manufacture, distribution or consumption—a most able successor of his father, whom he succeeded as Engineer of the Liverpool works. The joint experience of father and son, therefore, extends over a large part of the history of the gas industry. The afternoon spent with Mr. King was one of exceeding interest and profit. Mr. King visited the United States some years ago, and was so well received by our engineers that I was not surprised to hear him say that he hoped to be able to come over within the next year or two.

This meeting of the Gas Institute was of special importance in view of the attendance of 150 members of the French Association, headed by their widely-known President, M. Albert Ellissen. I found the large hall of the Society of Civil Engineers crowded. Not only were England, Scotland, Ireland and France represented, but many engineers were present from other parts of Europe, and even from far away Australia.

Promptly at 10 o'clock of the first day the President and members of the Council took their seats. The same plan as that witnessed in the House of Commons is carried out at the meetings of the Gas Institute. In the House of Commons the front benches are occupied by the members of the Cabinet; so at the Institute meetings the front seats are filled by members of the Council. I also saw many familiar faces, among the number the commanding figure and expressive face, with full beard and dark eyes, of Geo. Livesey, Chairman and General Manager of the South Metropolitan Gas Company, of London; the stout, typical Anglo-Saxon, Chas. Hunt, Engineer of the Birmingham Corporation Gas Works; the bluff Robert Morton, with silvery hair and marked Scotch accent, for so many years Engineer of the City of London Gas Works (now amalgamated with the Gas Light and Coke Company). Mr. Morton is the inventor of the self-sealing lid which bears his name, the sale of which, I was informed, brought him in a handsome income. Another glance over the assemblage revealed gentlemanly Wm. Foulis, with blue eyes and ruddy complexion, Engineer of the Glasgow Corporation Gas Works; Wm. King, of Liverpool, whose modesty forbade him accepting the nomination for the Presidency, to which he was entitled as First Vice-President, thereby leaving an opening for another well-known engineer, Henry Woodall, late of Leeds, England, but for three years past of Australia—near him sat his distinguished brother, Corbet Woodall, whose time is largely employed in piloting the business of various gas companies through the mazes of Parliamentary law; Thos. Newbigging (the author of the valuable handbook which bears his name), 6 feet in height, with long, grey beard and intellectual brow—an easy speaker who never failed to command the complete attention of his audience; Henry Hack, the able associate of Chas. Hunt, of Birmingham—Mr. Hack spoke of the many attentions he received during a recent visit to the States, and wished to be remembered to his friends; the witty Irishman, Denny Lane, Secretary of the Cork Gas Light Company, with silver grey hair and dark eyes; Frank Livesey, Engineer of the South Metropolitan Gas Company; Magnus Ohren, the widely-known Manager of the Crystal Palace District Gas Company; Geo. C. Trewby, famous as the Engineer of the great corporation that annually carbonizes in London nearly two millions tons of coal. By the side of the genial President—Chas. Gandon—sat one whose name is so well known on this side of the water—W. H. Bennett, Secretary of the Gas Institute (of nearly the same age and figure as Chas. Nettleton, who for so many years occupied the same position in the American Gas Light Association), an even temper, great grasp of detail, polite, helpful and cordial, who reminded me constantly of Mr. Nettleton. Let me introduce just here the fact (which is not so well known in the United States) that Mr. Bennett's employment, in addition to the great work devolved upon him in the matter of Gas Institute affairs, is that of a patent agent. His long experience and great knowledge concerning gas matters fit him thoroughly for work of this special character, and I would earnestly recommend any of your readers who desire to introduce their inventions abroad to arrange with Mr. Bennett to take out their patents.

As I looked over the assembly in the amphitheater I recognized many other faces of men whose names are familiar on both sides of the Atlantic, among the number that of your correspondent, N. H. Humphrys, of the Salisbury Gas Works. His clear cut features, deep set eyes and trim figure, clad in dark raiment, marked him at once as a man of great scientific attainments. The cheery face and stout figure of Wm. Sugg recalled my first meeting with him six years before in the same place. In the center of the hall I noticed the closely-compressed lips, cold grey eyes, white face and thin mustache of Geo. Bray. By the side of Mr. Gandon sat the President of the French Gas Managers Association, Albert Ellissen, whom I first met at Paris in 1870. The red ribbon of the Legion of Honor contrasted strongly on the black broadcloth of his coat lapel. His ready command of the English language caused his speech (read from manuscript) to be still more highly appreciated.

Following my introduction by the President, he kindly mentioned that I was the accredited delegate of the Western Gas Association, and called me from my place in the audience to the platform by his side, where I read the communication. At the announcement of my name I was agreeably surprised by the storm of applause that greeted it, which continued until I took my place on the platform, and for some time after, and was repeated at intervals during the reading of the letter.

It would be impossible for me to enumerate the many acts of kindness received from our English friends, not only during the session of the Institute, but on the famous excursion to the great Beckton Gas Works, to the Naval Dock Yards at Portsmouth, and at the evening reception at the Grosvenor Gallery.

Great applause also greeted the names of J. P. Harbison, Emerson McMillin, and C. J. R. Humphreys, who, with myself, had the honor of being elected members to the Gas Institute. I had the pleasure, also, of subscribing my name to the application for membership of A. C. Humphreys, whose application was received too late to be acted upon at the last session.

I urged strongly that a delegation of English and Continental Engineers should attend the next annual meeting of the American Gas Light Association at Toronto, and received the assurance of some that they would endeavor to be present.

While my stay abroad was somewhat limited, yet the numerous invitations extended me to visit gas works and inspect apparatus, and other appliances and systems of working, enabled me to get a very thorough insight into the improvements made since my last visit. I wish specially to express my indebtedness to Mr. J. Stellfox, Engineer of the Belfast (Ireland) Gas Works, who is about to put in operation the first practical application of the "Claus System of Purification in Closed Vessels." He devoted much time to a very full and complete description of the system, and promised to let me know the results at an early day. I also had an interview with William Young, of Scotland, whose somewhat similar system is soon to be tried on a large scale. The comments of English, Scotch and Irish Engineers, together with these observations, only serve to confirm my belief that the next great step in gas purification will be in this general direction.

Several gas companies are using successfully the Cooper Coal Liming Process, Brin's Oxygen and the J. G. Harvey systems of purification, by which the life of the oxide or lime is continued for not only months but years, without opening the purifiers, except to remove the oxide doubled in volume by the accretion of sulphur. The recovery of sulphur is being economically effected at several gas works.

The Ross steam stoker was favorably commended for its effectiveness and economy. Mechanical stoking is gradually being adopted. Several works have introduced the West compressed air machine.

Frequent references were made to the visits of your late editor, Major G. W. Dresser, and pleasant words were also spoken by those who had met Messrs. Greenough, Vanderpool, Forstall, Benson, Littlehales and others of the fraternity who have been in England. American gas managers will be assured as cordial a welcome in the future as during the past.

GEO. SHEPARD PAGE.

69 WALL STREET, NEW YORK.

The Coal Fields of West Virginia.

Prof. I. C. White, of the West Virginia University, is the author of the following well-written article on the great coal measures of West Virginia:

That "honesty is the best policy" has been known to the race for a very long time. Yet, strange as it may seem, there are evidently many people still living who believe that the aphorism in question applies to individuals only, and that communities, municipalities, states, and nations may violate it with impunity. No greater mistake can be made. No more surely will the individual who misrepresents and overstates his financial resources, in order to obtain a temporary and fictitious credit, finally come to grief and never recover the confidence of those whom he has betrayed, than will the community or State which permits its natural wealth to be misrepresented and exaggerated, suffer ever after from the evil reports of those who have been misled.

One great reason for the slow development of our State is to be found in this tendency of some of our people to overrate the mineral wealth of the State, the natural result being that all the statements are discredited. A few glistening scales of mica (to be found in every sandstone) are heralded forth to the country as the outcroppings of a tin or silver lode of fabulous value, while lead, gold, and copper "finds" are reported so frequently that we cannot blame the general public for being incredulous as to the actual value of our resources. It is true that much of this misrepresentation is not intended to deceive people, for the vast majority of those who scatter these reports know nothing of the occurrence of the minerals in question, and hence they can perceive no improbability in any statements that may be made with reference to the discovery of them. This fact, however, does not lessen the evil done. In this age of specialization no one is entitled to hold and propagate opinions on any subject, unless he is thoroughly familiar with it from long and close study; but the people who send abroad these exaggerated reports concerning the richness of certain localities in West Virginia, in nearly every form of mineral wealth, seem to be entirely unconscious of the above truism.

In view of these facts, it is necessary for the benefit of our people, as well as for the information of others, that a list of things that we do not have should be given. Those who seek gold, silver, copper, tin, zinc, lead, or any other of the rare or precious metals, should give West Virginia a wide berth. She has none of these. Traces there may be of all, but not in quantities sufficient to render mining it profitable; and hence it can be truthfully said these things are not among our possessions. We have so much of natural wealth in other things that we can afford to be perfectly frank about these matters to which we can make no honest pretensions. Bountiful nature has given to West Virginia neither precious minerals nor precious stones; but she has lavished upon us such an infinite wealth of common minerals and common stones and other common things that our heritage is vastly richer than that of the people who can number the precious metals among their inheritances.

What we do have are these: Coal, in greater quantity and variety than any other State in the Union; fire and pottery clays unexcelled; limestone in great abundance and purity; building stones of most excellent quality and inexhaustible quantity; petroleum and natural gas, the modern fuel; iron ores we have in considerable quantity, and glass sands in great plenty. These, with some manganese, and one or two others of small importance, make up the list of our available minerals. To some it may be disappointing, especially if they have been accustomed to look upon our hills and mountains as vast storehouses of the precious metals and every other form of mineral wealth that has ever been discovered; but indeed it should not be so, for if we had nothing but our coal we should still possess mineral wealth of greater value than that of any other State—of greater value than all the gold and silver deposits of the Pacific coast.

Few realize the immense value of the coal fields of our State. Coal is such a common and abundant mineral that most people, when thinking of valuable minerals, generally do not count it at all. But a short time since and many people supposed coal was soon to be a thing of the past; that natural gas would entirely supplant it, and render coal lands valueless. No greater mistake could be made. No one can forecast with certainty just how long the natural gas fields will continue to hold out; but nothing is surer than that they can and will be practically exhausted within the lifetime of the present generation. Both experience and theory unite in testifying to the ephemeral character of this material. Wheeling has seen one natural gas field (Wellsburg's) come to an end near her gates; and, unless the writer misinterprets the "signs of the times," she will see another one go out, so far as manufacturing purposes are concerned, within the next decade. As one writer has put the case, "Natural gas was only intended to teach man that he has been burning coal in a crude and barbarous fashion; and having introduced the age of gaseous fuel, it will pass off the stage as wood for fuel has already done." Of course some gas fields will last longer than others, and where only one or two wells have been drilled the flow may continue for centuries; but its fleeting nature, as compared with coal, can hardly be questioned.

All this, of course, but emphasizes the value of our inheritance in coal, since processes have even now been discovered for manufacturing fuel gas from coal so cheaply as almost to rival the cost of natural gas. Then, too, as prosperity in one industry but stimulates another, so, too, the immense yield of the natural gas wells of the past year has been accompanied by a greater output of coal in our country than was ever known before. And thus it happens that even if natural gas should disappoint the opinions of the savants, and prove to be permanent, its influence would only increase the value and stimulate the production of coal, simply because the areas in which it can be found in large quantity are small and restricted, compared with the immense extent of the regions that can never hope to get it.

LARGEST COAL FIELD IN THE WORLD.

To the largest and most valuable coal field in the world geologists have given the name Appalachian. It covers an area of nearly 60,000 square miles, and beginning near the northern line of Pennsylvania extends southwestward across that State, and, taking in nearly the whole of West Virginia and a broad strip from the southern part of Ohio, passes on through eastern Kentucky and Tennessee, to end in Alabama, nearly 500 miles from its northern terminus. The shape of this great field is, roughly, that of a canoe, and West Virginia lies within some of its broadest and richest portion. In only 7 of the 54 counties in West Virginia is it impossible to find bituminous coal—viz., Jefferson, Berkeley, Morgan, Hampshire, Hardy, Pendleton, and Monroe.

The column of rock which holds the coal beds in the Appalachian field has been subdivided into several groups, and as these come to the surface in different portions of the State, and obtain coals of distinctly different quality, I shall briefly describe each, and trace the line of their outcrops across the State.

At the base of the series, and therefore the lowest group of the true coal measure rocks, we have what is usually termed the conglomerate measures, because the great sandstones which are there interstratified with the beds of coal and slate often contain pebbles of quartz and other hard rocks in great abundance. The group has also received several other names, among which may be mentioned No. 12 conglomerate, Pottsville conglomerate, seral conglomerate, and the millstone grit of the English geologists. The group of coal beds which these rocks contain have been termed the New river coal series, from that region of our own State where the beds, as a whole, have their grandest development.

The sandstones of this series are noted for their hardness and consequent power to resist the action of the elements. Being composed almost entirely of quartz pebbles and grains, they form great sheets of protecting rock which is almost indestructible by atmospheric influence, and thus it happens that this group of beds is the principal factor in forming the wild, picturesque scenery of our mountain State. The wild gorges and canons of the Cheat, the Gauley, the New, the Guyandotte, the Big Sandy and other West Virginia rivers are all formed by this series of rocks. All of the ridges and peaks of the Alleghenies are capped and protected by this friendly mantle. Wherever these rocks come to the surface, wildness, barren soils and precipitous slopes prevail; but when they dip below the drainage levels the mountains disappear, and in their stead we find rounded hills, with gentler slopes and broader valleys.

FORMATION OF THE COAL.

Another peculiarity of this series is that although it forms a continuous sheet of beds under all of the 60,000 square miles of the Appalachian coal field, yet it contains coal in workable thickness and purity only around the borders of the fields in a comparatively narrow rim. Thus, while there are valuable coal beds in Jackson county, Ohio, along the northwestern border of the group, and also opposite this along the southeastern border, in Fayette county, West Virginia, no workable coal would be found if a shaft should be sunk to the series, say, at the mouth of the Great Kanawha, or at any other point 20 to 30 miles distant from the respective borders of the field; the same hard sandstones and pebble would be encountered, but they would hold only thin streaks of coal and bituminous slates.

Another feature of these conglomerate coal measures is the great purity of the coal beds when they attain workable dimensions. These early formed coals are singularly free from injurious quantities of sul-

phur and ash, the bane of some coals. Their purity in this respect is probably due to the fact that just previous to the spread of the great peat swamps of this early epoch, the floor of the entire Appalachian coal field was sheeted with a deposit of clean sand and gravel, thus effectually covering up the muddy sediments of a previous epoch, and causing the streams which drained into the peat or coal marshes of the time to be clear and free from impurities, like our own mountain brooks of the present; but however this may be, the fact remains that these conglomerate coals are of exceptional purity.

Another strange thing about these coals is that along the northwestern border of the Appalachian field, the quality of the coal is entirely different from that found on the opposite or southeastern rim of the field. Along the former, through Pennsylvania and Ohio, these coals are nearly always non-coking, and can frequently be used in furnaces just as they are brought from the mines, and are hence called "block" coals; but on the southeastern side, through West Virginia, Virginia, Kentucky, etc., the coals of this series are universally of the coking kind, and being so pure they are fast becoming justly celebrated for the production of coke of the highest grade.

The conglomerate rocks crop out on the surface in West Virginia through the following counties, beginning at the north: Preston, Mineral, Grant, Tucker, Randolph, Webster, Pocahontas, Greenbriar, Nicholas, Fayette, Raleigh, Summers, Mercer, Wyoming, McDowell and Logan. Until we get southward as far as Nicholas and Webster there appears to be but one workable bed of coal in these conglomerate measures, and it lies near the bottom of the series. I have observed it at several localities, however, in Preston, Tucker, and Randolph, in each of which the bed is about 3 feet thick and very fair coking coal. But on southward through Webster and Nicholas into Fayette the whole group of rocks increases in thickness very fast, and when we come to the New river, in Fayette county, these rocks have a thickness of 1,400 feet, and contain three workable coal beds, with thicknesses of 3 to 5 feet. It is from these beds that the famous New river coke is manufactured which now sells in the market at a higher figure than the Connellsville product.

THE MOST PRODUCTIVE FIELDS.

It is not, however, till we come to Mercer, Wyoming and McDowell counties, at the extreme southwestern corner of the State, that we find the thickest and most productive coal beds in this series of rocks; for here the great Pocahontas bed attains a thickness of 6 to 10 feet over an area of several hundred square miles, while at many localities two other beds may be found above the Pocahontas veins, with a thickness of 4 to 6 feet.

The proximity of this great field of pure coking coals to the immense iron ore deposits of the South renders it valuable beyond computation, and yet its development has only just begun. It is only about six years since the first car load of coal was shipped from the Pocahontas region, near the line of Mercer county, and yet during the past year one million tons of coal and coke have gone to market from this region alone. Lying on top of this conglomerate or New river coal measures we find another group of rocks with several valuable coal beds included, and to this series has been given the name of lower coal measures. To this group belong the coal beds which have recently attracted so much attention and capital to Clearfield, Jefferson and Cambria counties, Pennsylvania. Within the limits of these measures there are usually five coal beds which at one time or another furnish valuable fuel, viz., in descending order: Upper Freeport, Lower Freeport, Upper Kittanning, Lower Kittanning, and Clarion coal beds.

This coal series enters West Va. from Pennsylvania in Monongalia and Preston counties, with a thickness of 250 to 300 feet, and contains two valuable coal beds, the Upper Freeport and Lower Kittanning, the former being locally known as the "Austen coking" coal, and the latter as the "Newburg shaft" seam. These two beds are separated by an interval of shales and sandstones 100 to 180 feet thick, and they are both easily accessible over a very large area in Monongalia and Preston. They have an average thickness of 5 to 6 feet each, and both make splendid coke. The same two beds reappear on the North Potomac, where they underlie an immense area along the West Virginia Central Railroad in Mineral, Tucker and Grant counties. They are both mined near Davis, the upper one being called the "Thomas seam" and the lower one the "Davis seam." Both have been successfully tested for coke in the Davis region.

UPPER AND LOWER SEAMS.

On southward from the counties already mentioned the outcrop of this series may be traced through Taylor, Barbour, Randolph (where the U. Freeport is the celebrated "22-foot seam"), Upshur, Braxton, Webster, Nicholas, Clay, Kanawha, Fayette, Raleigh, Wyoming, Boone, Logan, Lincoln and Wayne. These are the counties along the eastern side of the Appalachian field, where the coals of this series come up to the surface, while on the opposite side of the field the only locality where they come up to daylight is in Hancock county, and for a short distance along the Volcano uplift in Wood and in Wirt. The series, however, underlies all the other counties of the State, which lie west from the belt first mentioned, and, unlike conglomerate series below, seems to have valuable coal beds in it at every locality. This we learn from the records of drill holes which have been made in nearly every part of the State. One of these beds is now mined at Wellsburg by a shaft 200 feet deep, and the drill shows that the same valuable bed underlies Wheeling at a depth of only 500 feet, while at Parkersburg a good bed of coal seven feet thick, and belonging to this same series, was passed at a depth of 1,100 feet. These depths may be regarded by some as rendering the coal beds in question entirely valueless, but such should remember that the development of this country has just begun, and that England raises nearly all of her immense output of coal from depths of 1,000 to 3,000 feet. These are mentioned simply to show the vastness of our resources in coal, and the permanency of supply of this "mainspring of civilization," and hence that the railroads, cities and manufactories which may be built within our borders can depend upon an abundant supply of fuel for many centuries, even from the beds of coal which can be operated from the surface; but when these shall have been exhausted we shall still have an infinite wealth of these "black diamonds," which can be easily obtained by going down a few hundred feet below the surface. When that time comes West Virginia will possess a monopoly of coal in the Appalachian field, for it will be practically exhausted from all of the States around us before that from our early accessible beds is used up. These deeply buried beds are found at a depth of 1,500 feet below the valleys in some portions of the State. In passing westward to the region of the Great Kanawha the lower coal measures expand wonderfully in thickness, and instead of a rock series of 250 to 300 feet, as in Preston and Monongalia, we get 1,000 feet of rock between the uppermost coal bed of the group and the top of the conglomerate series below. Accompanying this expansion of the measures there is a great change in the character of the coal in the different beds. Instead of soft coking coal we find cannel, and "block" and "splint" coals, which being quite hard, and crumbling with difficulty, make splendid shipping coals and the perfection of domestic fuel. The lowest bed, however, the Clarion or Eagle seam, makes a splendid coke, and the Lower Kittanning or Campbell's Creek seam can also be coked successfully in some regions. Hence the territory along the Elk and its tributaries, the Great Kanawha and its tributaries, as well as the Guyandotte, Twelve Pole, and the Big Sandy, abounds in splendid coal beds of this lower coal measure series.

THE BARREN MEASURES.

To the next higher group of rocks geologists have given the name of Barren Measures, because the coal beds they contain are usually thin, irregular in thickness and poor in quality. Along with much sandstone, thin limestones and other rocks, this group of beds contains a great deal of soft, red shale, and hence it makes a broad belt of red soil almost exactly in the central line of the State, from Monongalia clear through to Wayne. The thickness of the series varies usually between 500 to 600 feet, except toward the southwestern portion of the State, where it expands in thickness like all the other groups, and measures 800 feet near Charleston.

Although usually meriting the name "Barren Measures," yet occasionally some good coal is found in this group over restricted areas. The Bakerstown coal, or "four-foot" bed of Preston county, is one of these exceptions, and the Brush Creek bed which caps the hills at Coalburg on the Kanawha, and furnishes some fine "block" coal in several counties of the southwestern part of the State, is another. These two beds belong in the lower half of the group, and the last named is the lower one. The "Barren Measures" are limited above by a great bed of coal, the most important one in the Appalachian field, the famous Pittsburgh bed. This bed marks the beginning of another and the last of the groups of the true coal measure rocks, which is termed the "Upper Coal Measures." This series, unlike those below it, attains its maximum thickness and importance at the northern end of the State instead of the southern. In Monongalia county it has a thickness of 380 feet, and contains four valuable coal beds disposed as follows: At base, the great Pittsburgh bed with a workable thickness of 7 to 9 feet; 40 feet above this comes the Redstone bed, with a thickness of 4 to 5 feet; 60 feet above the latter lies the Sewickly bed, having a thickness of 5 to 6 feet; while 260 feet above the last, and capping the series, we get the Waynesburg bed, with a workable thickness of 6 to 7 feet. Thus it happens that in many of the hills

of Monongalia 20 to 25 feet of merchantable coal may be mined without shafting.

In coming southward from Monongalia the Pittsburgh, Sewickly and Waynesburg coals hold their usual thickness through Marion county, but the Redstone bed thins out before reaching there, and on beyond Marion the Sewickly and Waynesburg beds dwindle down to thin unimportant layers, leaving the Pittsburgh as the only valuable coal in the group, but the latter maintains such a standard of thickness and value as to amply compensate for the loss of the higher members possessed in more favored Monongalia and Marion. As we pass westward from the Monongahela river, in the last mentioned counties, these upper coal measure beds dip beneath the surface down into the great trough of the Appalachian Basin, and do not come up to daylight again till we reach the Ohio river valley near Wheeling, and here we find that only the Pittsburgh bed remains important, the others being represented by thin and slaty beds; hence it will be observed that, so far as our State is concerned, the upper coal measures derive their chief importance from the presence of one bed—the Pittsburgh—but it is so valuable as to merit a more detailed description than could be given to the other individual beds within the limited space of this article.

THE MOST IMPORTANT SEAM.

This Pittsburgh bed, as we have already stated, is the most important seam in the entire Appalachian field. It is the same bed which furnishes the coal for the famous Connellsville coke, and hence is often called the Connellsville or Youghiogheny bed. Coming as it does so high up in the series of rocks, it has suffered more from erosion than any other of the coal beds below it, having been worn away many thousands of square miles from where it once existed. This we realize when crossing the Alleghenies to Piedmont, and find the same Pittsburgh bed represented in the "Big Bed" of that region and the Georges creek basin, where it is 15 to 20 feet thick. We also discover the same coal bed on the heights at Elk Garden, on the West Virginia and Central Railroad, and in the isolated patch at Fairfax Summit, more than 2,300 feet above the sea. The remnant of this bed in Copeman's knob, near Kingwood, the scattered patches on the hilltops around Newburgh, and the few acres of it on the highest summits near Bealington, taken in connection with the Fairfax and Elk Garden areas, will give the reader some idea of the vast intermediate surface from which it has already been mined by the ceaseless action of the elements. But fortunately for our State, the deepest portion of the Appalachian trough passes across its territory from the Pennsylvania line clear through to the Kentucky border in Wayne county, and has thus preserved for us in its ample fold a very large area of this valuable bed. Its outcrop has been followed from the State line southward past Morgantown, Fairmont, Clarksburgh, Weston, Troy, Glenville, Sutton, Sissonsville, and on the Great Kanawha at Raymond City. Beyond this river the coal is thin and found in interrupted patches, but it has recently been opened in the tops of the hills back of Huntington, and the last patch of it within the State is in the summit of a high knob overlooking the Big Sandy, and 10 miles above its mouth. Kentucky receives all of the coal beds under this one from our State; but she gets not an ounce of the great Pittsburgh seam, for it passes into the air over the tops of her highest hills, from a point in our State within a stone's throw of her territory.

On the Ohio river side of West Virginia this bed comes into the tops of our hills opposite Steubenville, and, dipping down from the north, is only 100 feet above water level at the mouth of Wheeling creek. It has thus been the bed rock of Wheeling's industries and prosperity, and it is the foundation stone on which her sister city, Pittsburgh, has built such a grand superstructure of manufacturing interests. And notwithstanding the temporary advantages of natural gas, this coal bed will be the main source of the future greatness of the two cities.

BELOW THE WATER LEVEL.

Followed below Wheeling, this coal gradually approaches the river level and passes beneath the same a short distance below Benwood, and although it is reached by the shafts at Moundsville, the horizon of the coal keeps constantly below water level till we reach the Volcano oil uplift a short distance below St. Marys. Here the place where it should be is lifted 250 to 300 feet above the river for two or three miles, but the coal is wanting or so thin that it is practically absent, and the same thing is true all along this arch from Eureka through by Volcano to Burning Springs, and beyond toward Spencer. How broad this barren belt may be we cannot yet certainly determine, owing to want of observations in the central part of the State; but there are some reasons for believing that this barren region is coincident with the course of the Volcano arch, and that it thus extends from Eureka through to Burning Springs, on the Great Kanawha, 10 miles above Charleston; and that along this line for a distance of several (10 to 15) miles on each side, no valuable deposits of this coal can be found. We know, however, that the coal comes in again west of this arch, for when the Ohio turns north below Letart Falls the rise of the rocks soon brings the coal to the surface at Hartford City and other points in that region, where it is still a valuable bed, though much reduced in thickness from its normal size at the northern end of the State.

The counties, then, which have this great coal bed may be enumerated as follows: About one-half of Brooke, nearly all of Ohio, all of Marshall, Wetzel, Tyler, Doddridge, the eastern halves of Ritchie and Gilmer, the northern half of Braxton, large areas in western Upshur, Barbour, and Taylor, much of Lewis, nearly all of Harrison, three-fourths of Marion, and three-fourths of Monongalia. On the west side of the barren slip, this coal will be found in the portions of Putnam and Mason north from the Great Kanawha, probably all of Jackson, and the most of that portion of Kanawha north of the Elk and Kanawha rivers.

Of course, under much of this large area the bed can only be reached by shafting; but a depth of 300 to 400 feet will reach it along most of the valleys, even where it is deepest, except near the summits of the divides, where it is deeper of course, but still within the limits of easy access whenever the time shall come that it is needed for fuel supply.

One of the finest areas of this coal, and the most easily accessible, lies along the Monongahela river, between the Pennsylvania line and the tier of counties through which this river flows—viz., Lewis, Harrison, Marion, and Monongalia. The distance from the State line to Weston, by the meanders of the river, is more than 100 miles; and throughout this long distance the great Pittsburgh bed is almost constantly above water level, and cropping out from either bank of the stream at a moderate elevation above the same, so as to be most fortunately situated for cheap and successful mining.

The universal excellence of this coal for all purposes of fuel, gas, coke, and every other use to which coal can be put, renders the field in question one of the most valuable in the country, or in the world for that matter; and the railroad that first opens it up to market will have a monopoly of good things in the coal traffic for a very long time.

It was formerly supposed that this coal would not make merchantable coke, but the successful working of nearly 200 ovens at Montana, on the Fairmont, Morgantown and Pittsburgh Railroad, together with the successful plants at Fairmont, Clarksburgh, Tyrconnell, etc., has set this question at rest, and proven that the coal in question will make a coke but little inferior, if any at all, to that from the celebrated Connellsville region, of which the Monongahela country is simply a southward extension.

THE BASIS OF OUR PROSPERITY.

It will be seen from this hasty and imperfect review of the coal fields of our State that the quantity of this valuable fuel which underlies the surface of our hills and valleys and mountains is almost beyond conception; and it does not aid the mind much to be told that if we put the workable thickness of coal underlying the 10,000,000 acres of our coal field at only 10 feet, the available product will be at least 10,000,000,000 tons. Impossible as it may be to comprehend the real meaning of such an array of figures, we can at least be assured that the basis of our prosperity is grounded so firmly in this wealth which lies hidden in our hills, that nothing conceivable to human reason can thwart our growth or prevent our continued progress in anything pertaining to industrial welfare.

The West Virginia coal field is 1½ times larger than that of Great Britain, the production of whose mines is nearly 200 million tons annually. In the not distant future, when the net-work of railways, which the benefactors of our State are now planning for its better development, shall have connected our mines with links of steel to the great arteries of trade and commerce, and our production of coal shall have risen to even half what Great Britain's is, then will our people begin to realize more clearly the enormous value of the fuel wealth to which we are heirs.

On the morning of July 1st the stockholders of the Anniston Gas and Light Company met in the office of Messrs. Caldwell & Johnston for the purpose of effecting a permanent organization. The number of shares represented was 499 out of a possible 500, and the officers chosen were the following: Directors, Messrs. C. H. Camfield, F. M. Hight, W. S. Larned, M. Kind and J. C. Keith. President, C. H. Camfield; Secretary, W. S. Larned. The Directors then formally accepted the works from the builders, the New York Contract Company, and completed the organization by electing Mr. W. H. Hayden Supt. and Gen'l Manager of the plant.

On the Use of Oxygen in the Purification of Coal Gas.

By W. A. Valon.

[A paper read at the 25th Annual General Meeting of the Gas Institute. Reprinted from the London *Journal*.]

The experiments dealt with in this paper were conducted at the Westgate-on-Sea Gas Works, with the object of determining the value of adding pure oxygen to the gas in the process of purification by oxide of iron or lime. The whole of the gas made from September, 1887, to the end of May, 1888—a period of eight months—was treated. The coal used was Pelaw Main; and the average make of gas per ton carbonized was 9,960 cubic feet. No cannel was employed. The arrangement shown in the accompanying engraving was one finally adopted—viz., to admit the oxygen behind the exhauster outlet by a pipe *H*, connected to a wet meter *G*, supplied by a small holder *I*; the latter being fed from a steel tube reservoir *A*. A regulator *B* was placed between the tube and the holder; a small safety valve *D* on the holder, in case of accident to the regulator; and the holder was balanced to give the average percentage required from time to time. This arrangement was so far perfect of its kind that the quantity passed was very evenly spread over the whole 24 hours. If a gasholder large enough to contain the contents of one tube had been available, the foregoing arrangement could have been dispensed with.

When first starting the experiment, it was thought desirable to use lime and oxide mixed; the lime being used for the purpose of extracting carbonic acid only. This however, was abandoned after a week or two, as it complicated the observations. Fresh lime added from time to time, to keep down carbonic acid, upset the oxide purifier for a day or two; and it was necessary to commence *de novo*. It was therefore determined to separate the lime and oxide, and observe the action of oxygen on each independently. When this was ascertained accurately, they could be re-united, if thought advisable. In opening the lime box to carry out this plan, my attention was immediately arrested by what was observed; but this will be alluded to later on.

The experiment took the following order:

A 1.—Effect on sulphuretted hydrogen in coal gas of adding known quantities of pure oxygen during the process of purification with oxide of iron. (This was shown on a colored diagram exhibited during the reading of the paper.)

A 2.—Effect of same on sulphur compounds.

A 3.—Effect of same on the illuminating power of the purified gas.

B 1.—Effect on sulphuretted hydrogen in coal gas by adding unknown quantities of pure oxygen during process of purification by lime.

B 2.—Effect of same on sulphur compounds.

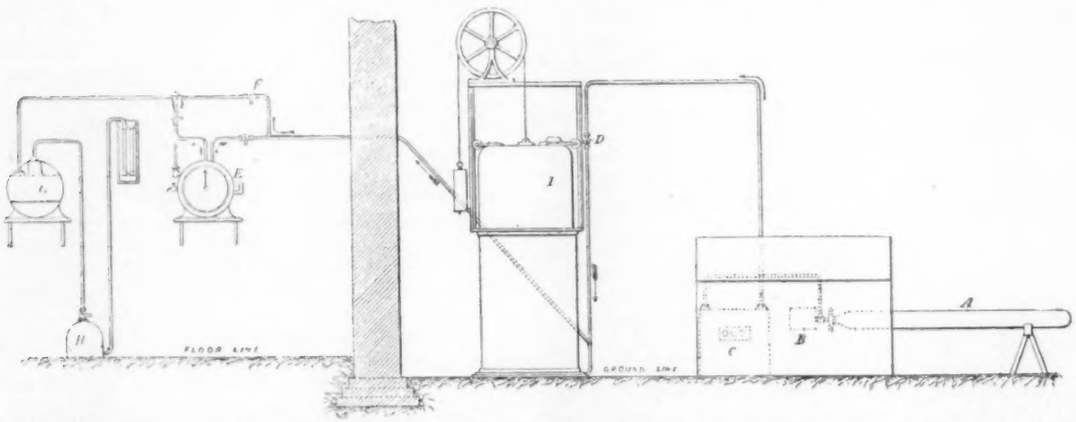
B 3.—Effect of same on the illuminating power of the purified gas.

It will be important to note that the crude gas at Westgate, after it has passed the condensing and washing apparatus (which it does before entering the exhauster) contains at the inlet to the purifier an average of 620 grains of sulphuretted hydrogen in 100 cubic feet, as measured by a Wanklyn bottle.

A.—*Effect with Oxide of Iron Purifiers.*

Two boxes 12 ft. by 12 ft. by 4 ft. 6 in. deep, containing four trays, were charged with about 10 tons of oxide each. For facility of reference these will be called Nos. 1 and 2 respectively. When operations were commenced, No. 1 had been in use some time; and when worked with 1¼ per cent. of air gave, with 620 grains of sulphuretted hydrogen at the inlet, 400 grains at the outlet, and would, in the usual course, have been considered fairly entitled to come out in a very short time. No. 2 was doing the catch work for No. 1; and at the outlet of No. 2, the gas was nearly free from sulphuretted hydrogen. This describes the condition of things when oxygen was first introduced into No. 1.

It was determined to use varying quantities of oxygen, commencing at 0.25 per cent. of the volume of the gas treated, and to advance steadily, watching the effect produced. There was nothing of importance to record until 0.60 per cent. had been reached, excepting the improvement in the illuminating power, and a gradual reduction of sulphuretted hydrogen at the outlet of No. 1. At this percentage, however, after running a day or two, the outlet of No. 1 gave no indication of sulphuretted hydrogen. The quantity of oxygen was then carefully reduced to 0.50 per cent., when sulphuretted hydrogen again appeared at the outlet of No. 1; leaving 50 to 80 grains to be taken out by No. 2. Considerable time was devoted at this point to determine the quantity of oxygen required in practice to be admitted to remove the sulphuretted hydrogen present. The result was to leave no doubt that practically 1 foot of pure oxygen is sufficient to remove 1,000 grains of sulphuretted hydrogen contained in the crude gas. This works out at about 600 grains of the former to 1,000 grains of the latter, or 0.10 per cent. in volume of oxygen for every 100 grains of sulphuretted hydrogen per 100 cubic feet of gas—not very much beyond the theoretical quantity.



A, cylinder of of oxygen compressed to 120 atmospheres; *B*, patent screw regulator or governor; *C*, dry gas meter for measuring the oxygen; *D*, plug tap, lever and weight, so that when the holder rises it shuts off the oxygen, when it falls it allows oxygen to pass; *E*, test meter for reading the amount of oxygen passed in an hour by observations of one minute; *F*, bye-pass tap; *G*, wet meter to register the total oxygen passed into the gas main; *H*, gas main at the inlet to the exhauster; *X*, small holder for containing the oxygen

Arrangement for Proportioning and Admitting Oxygen Gas to Coal Gas Main.

Observations on the illuminating power were made concurrently with those on oxide. The best results were obtained when 0.10 per cent. by volume for every 100 grains of sulphuretted hydrogen per 100 cubic feet of gas was passed into the oxide, or about one-fifth more than the theoretical quantity required for revivification. The light was then equal to 15.46 candles; 0.15 per cent. of oxygen per 100 grains lowered the illuminating power 0.67 of a candle; 0.30 per cent., 1.3 candles. Finding this depreciation continuing with every increased percentage of oxygen, the latter was at once advanced to 0.50 per cent. to settle the matter; and this brought the illuminating power down 1.92 candles. The gas, without any admixture of oxygen, had an illuminating power of 14.67 candles. The net result of these experiments showed a decided increase of the luminosity of about 5 per cent. when the oxygen was slightly in excess of the purifying requirements; but beyond this point, illuminating power was lost, with each increase of oxygen.

For the purpose of instituting a comparison, experiments were conducted with varying quantities of atmospheric air; the results being as follows:

		Candles.
1.15 per cent.	admitted at hydraulic main	13.88
1.57 "	" " "	13.66
2.08 "	" " "	13.44
2.38 "	" " "	15.21
2.13 "	admitted at exhauster	13.39
2.39 "	" "	12.23

It will be observed from these latter experiments that, not only did the admission of air produce no beneficial effect, but a decidedly prejudicial one; and that the effect was practically the same whether the air was admitted at the exhauster or at the hydraulic main, although it may be mentioned that the gas travels through zinc strainers placed at frequent intervals along the whole course of the foul main, which latter is carried entirely around the retort house before reaching the air condensers. It should also be noted that the quantity of air employed was less than that necessary to contain the quantity of oxygen which had previously been found to act most beneficially; the illuminating power suffering to such an extent as to prohibit higher percentages being persevered with.

Temperatures.

Highest.....	65 0	72.00	71	76	63.0
Lowest.....	35.0	36.00	30	36	36.0
Average...	51.4	52.73	52	51	47.1

Thus during the experiments the temperature of No. 1 purifier gave an average of from 8° to 10° above the initial temperature of the gas at the inlet, when 0.10 per cent. in volume was passing through for every 100 grains of sulphuretted hydrogen in 100 cubic feet of the unpurified gas. When higher percentages of oxygen were used, these temperatures were increased in a proportionate degree.

The advantages obtained by the use of oxygen with oxide of iron as against air may be stated thus: (1) Almost complete revivification of oxide *in situ*. (2) Increased illuminating power. (3) Greatly augmented percentage of sulphur in spent oxide, and consequent higher market value. (4) The purification more efficiently conducted, with half the purifying space and two-thirds of the material. (5) A corresponding saving in capital and labor.

B.—*Effect with Lime Purifiers.*

The experiments with lime were conducted in a precisely similar manner to those just described with oxide of iron, oxygen being added until it could be detected in the purified gas. Using the same purifiers, each purifier was charged with 1 ton 10 cwt. of chalk lime, 85 per cent. of which was found to be in a suitable condition for purification. It was divided equally over the four trays, making layers 3 inches thick, each weighing 7½ cwt. It was early discovered that the same percentage of oxygen was required as in the case of oxide; and, therefore, the figures given above hold good in the case of lime. The illuminating power averaged 16.5 candles when 0.10 per cent. of oxygen in volume was used for every 100 grains of sulphuretted hydrogen present in 100 cubic feet of the gas at the inlet to the purifier. Daily testings were also made for sulphur in other forms than sulphuretted hydrogen, and with the percentage of oxygen stated above, averaged 6 to 8 grains per 100 cubic feet in the purified gas.

The carbonic acid in the gas at the inlet to the purifier was estimated by Mr. J. T. Sheard's apparatus, of which I cannot speak too highly. This was watched carefully from day to day, and only traces of carbonic acid were found passing the third tray in advance of the lime, which had become thoroughly spent for sulphur. This will be clearly understood by reference to the following table, which is marked with the sulphuretted hydrogen passing one side, and the carbonic acid on the other. It will also be seen what was the relative position of the two gases in the next purifier at the moment that No. 1 purifier was thoroughly spent for sulphuretted hydrogen and carbonic acid.

No. 1 Purifier.

Grains of H_2S.	Gas Tested at	Percentage of CO_2.
620	Fourth tray.	1.26
620	Third "	1.26
620	Second "	1.26
620	First "	1.26
620	Inlet.	1.26

No. 2 Purifier.

Grains of H_2S.	Gas Tested at	Percentage of CO_2.
50	Fourth tray.	Trace.
200	Third "	0.39
420	Second "	0.79
600	First "	1.09
620	Inlet.	1.26

Now, under ordinary circumstances, the sulphuretted hydrogen after initial fixation by the lime would have been displaced by the carbonic acid, and have gone forward; but, as may be noticed, nothing of the kind occurred—the sulphur becoming deposited in the free state, or permanently fixed, and so left behind. As already stated in the early part of the paper, some such result was expected by observation of the condition of the lime removed while experimenting with oxide; and these further experiments showed clearly that the carbonic acid was taken out, and the sulphur compounds resolved and removed almost simultaneously with the sulphuretted hydrogen, and in one combined operation. No. 1 purifier, having been thoroughly fouled with carbonic acid, was opened for examination. A sample of the spent lime is on the table for inspection. It will be observed that the sulphur is deposited in a solid form, the lime being perfectly carbonated, and therefore no nuisance therefrom can be possible.

Attention is called to the close position of the carbonic acid and sulphuretted hydrogen in the purifier; so that it may be clearly seen that the carbonic acid test is the only one necessary to determine when lime should be removed. As this should then be the same in quantity at the outlet as at the inlet, it need scarcely be added that it insures the lime being thoroughly used up.

From replies to inquiries addressed to engineers of large and medium-sized works (to whom the author takes the present opportunity of conveying his thanks), it appears that the quantity of lime used in purification in conjunction with oxide of iron or other supplemental method, ranges from 3.3 to 5.5 cubic yards per million cubic feet of gas. In these trials, with oxygen and lime alone, and with an average (as already stated) of 620 grains of sulphur per 100 cubic feet of gas at the inlet, two cubic yards of lime per million cubic feet of gas has sufficed to keep the sulphur compounds down to an average of from 6 to 8 grains per 100 cubic feet, and the illuminating effect has been at the same time maintained at 16.5 candles.

The table explains the condition of things when No. 1 purifier was opened; and the figure affixed was the result of the various testings just before the lid was raised. The maximum and minimum of sulphur and carbonic acid found in the crude gas during the course of the experiments are also marked. The material when removed from the purifier, on being weighed, was found to have increased from 1½ to 3½ tons. The temperatures were taken at frequent intervals during each day the experiments were in operation, and the record gave the following averages:

	Atmosphere.	Inlet.	No. 1 Purifier.	No. 2 Purifier.	Outlet.
Highest.....	68	51	79.0	66.0	53.0
Lowest.....	32	40	46.0	39.0	35.0
Average....	51	44	61.4	50.7	43.6

The experiments were continued with Nos. 2 and 3 purifiers, and one-half the necessary oxygen for complete combination, with the immediate and expected result that the sulphur began to migrate from one purifier to another. The sulphur, which at the inlet to No. 2 was 620 grains, at the second and third tray increased to 800 and 1,000 grains respectively. As with oxide of iron, air was substituted to the extent of 1.25 per cent. as a comparison against oxygen; and it was intended to increase this quantity still further, but the contrast was instantly so marked that it was thought unnecessary to pursue the experiments further. The result was as follows: (1) The illuminating power fell to 14.05 candles. (2) Sulphur compounds rose to 19 grains. (3) More than three times the space was required; and it was also found impossible to saturate for carbonic acid—indeed, there was not sufficient purifying room to accomplish this.

The principle results of the experiments just described on the substitution of lime and oxygen for the present lime and oxide of iron in purifiers may be briefly summarized as follows:

(1) Lime can be wholly used in conjunction with oxygen for the purification of gas; indeed, the action is so quick and decisive that it would be difficult to interpose oxide of iron with any good effect. Nevertheless, if it is possible, the benefits attending the action of oxygen on oxide of iron already mentioned would accrue.

(2) By the regulation of oxygen to known quantities of impurities, the sulphur compounds may be removed without difficulty; need cause no anxiety to the engineer; and can be reduced to a point hitherto unattainable in practice.

(3) The purifying space and plant at present required for lime is reduced by more than one-half, the lime used by nearly one-half, and labor in proportion.

(4) Auxiliary oxide of iron purifiers are rendered unnecessary.

(5) Very considerable saving is effected in cannel used by the improvement produced in illuminating power.

(6) The sulphur deposited can, it is believed, be recovered in a merchantable form by heating the spent material, and collecting it in a properly constructed condensing chamber.

The Extraction of Oxygen from the Atmosphere.

At this point the question that naturally arises is the practical one, Can oxygen be produced as a commercial commodity at a reasonable price, so as to make it available from an economic point of view for the gas maker's purpose in purification? This question is answered in the affirmative; indeed, if it could not, these experiments, beyond their scientific interest, would be of little value to the practical gas maker. It may, therefore, be of interest to give a short general description of how oxygen is made by Brin's Company; and the simplicity and practicability of the method will appeal to and be appreciated by every manufacturer of illuminating gas.

Air is first deprived of its carbonic acid and moisture; being drawn by a pump through chambers containing lime and caustic soda, and it is then forced, by the same pump, under a pressure of about one atmosphere, through barium oxide contained in steel retorts about 8 inches diameter, heated in brick furnaces (by producer gas) to a dull red heat. At this temperature the barium oxide absorbs a large proportion of the oxygen contained in the air, becoming converted into barium peroxide; and the nitrogen and unabsorbed oxygen escape through a relief valve at the other end of the retorts. When the barium oxide is sufficiently peroxidized, the temperature of the retorts is raised to bright redness, and the pumps are, by shifting the valves, converted into vacuum pumps. The absorbed oxygen is, under the influence of the higher temperature and reduced pressure, given off again, and discharged by the pumps into the gasholder. The retorts containing the barium oxide thus reformed are allowed to cool to their previous temperature—viz., a dull red—when the barium oxide is again ready to abstract a fresh supply of oxygen from air. If care has been taken to obtain the barium oxide in a suitable physical condition and state of aggregation, and provided that the air supplied to the retorts has been freed from moisture, carbonic acid, and suspended matter, there seems to be practically no limit to the number of operations which may be effected by one and the same charge of barium oxide.

In conclusion, What is the cost of oxygen for purification? This is governed by two factors: First, the quantity of sulphur to be dealt with at the inlet to the purifier; and, secondly, the cost at which oxygen can be produced.

From the replies furnished, the first factor may be fairly taken as at from 500 to 700 grains at the inlet to the purifier, being an average of 600 grains. This latter quantity, on the basis of these experiments, will require 6,000 cubic feet of oxygen per million in purification.

The second factor, viz., the cost of oxygen by the method described, including interest of capital for plant, wear and tear, and all other manufacturing expenses, are given by Brin's Company at 5s. per 1,000 cubic feet; but should oxygen cost much more than this—say even 15s. per 1,000 cubic feet—then purification by its aid leaves a very large margin in its favor as regards cost. And when we add to this the comfort, reliability, and simplicity of this process (for lime needs no more attention than ordinary oxide of iron purification), it will be allowed—indeed it can hardly be denied—that, whether looked at from a scientific or from an economic point of view, the lime-oxygen mode of gas purification may be regarded as the most complete, simple, and reliable, as well as the cheapest method yet known.

Grebel's System of Tar Firing in Gas Works.

Our contemporary, the London *Journal*, reprints from *Revue Industrielle* a description of an arrangement of apparatus, devised by M. Grébel, Superintendent of the gas works at Guise, France, for the utilization of tar for the heating of gas retorts. The plan, as applied to a setting of seven retorts, is represented in fig. 1 of the accompanying diagrams; the method of injecting the tar, and the pulverizer employed in the operation, being shown in figs. 2 and 3. The agent used for breaking up the stream of tar is, as usual, steam; but compressed air may be substituted.

Upon the retort bench is placed a sheet iron tank, into which the tar is pumped. This receptacle is quite closed, so as to exclude all dust; and it is furnished with a strainer for the elimination of any impurities and foreign matters which may have found their way into the tar. It is also provided with an overflow pipe, and a tap, to allow of all the contents being drawn off for cleaning purposes, is fixed in the bottom. The supply pipe for the furnace is placed at a distance of about 4 inches up the tank. The system of pipes by which the tar is conveyed to the furnace is sufficiently clearly indicated in fig. 1 to render description unnecessary. The piping for the distribution of the steam is, like the other, fixed on the front of the setting; the quantity of vapor admitted being regulated by a cock. A steam pipe is carried into the tar tank, in order to keep the liquid practically at the point of ebullition. The setting to which the system has been applied at Guise was constructed for heating by coke; and the ashpan was filled with cinders up to a point about 2 inches above the upper level of the fire bars. In adapting such a furnace for tar firing, these bars are removed, and in their place is laid a flooring composed of firebricks, or simply of a layer of fireclay about 3 inches thick; the door being at the same time bricked up, so as to prevent the introduction of air from below. In the event of a return to the use of coke, the furnace could, of course, be readily restored to its former condition. If the flooring were composed of solid blocks, the fire bars might be allowed to remain, provided care was taken to interpose a thin bed of fireclay.

It will be seen that the injector *A* is by no means complicated in construction; and its upper extremity does not project more than 6 inches from the front of the setting. Its terminal orifice extends slightly into the furnace, and is located about 12 inches below the centre retort. The concentric tubes *M* and *G* (fig. 3) are connected outside the furnace by means of two filleted junction rings, the first of which carries the tubulure *V* of the steam pipe, and the second the tube *g* of the tar pipe. A screw cap *R* serves as a sight hole; and smaller screws *I I* facilitate

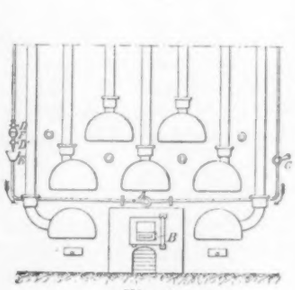
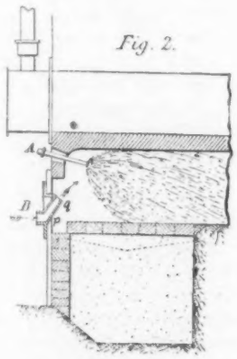


Fig. 1.

Fig. 2.



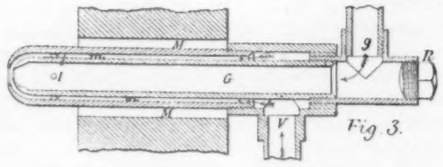


Fig. 3.

the centering of the inner tube G. The steam therefore circulates in the annular space *m m* The form adopted for the nozzle of the pulverizer is one that allows of the greatest economy of tar and steam, while the thorough breaking up of the former is insured. This appliance is about a foot in length. It works very regularly, and does not throw out the tar in the form of a sheaf, but rather in the manner in which water issues from the rose of a watering pot—a condition found to be highly favorable to combustion, the intensity of which may be regulated at will by means of taps.

One of the characteristic details of this installation consists in the arrangement of the furnace door, which not only serves for the admission of the air necessary for combustion, but at the same time imparts heat to the air. For this purpose there is employed a conduit *B* (fig. 2), rectangular in section, and slightly smaller at its upper than at its lower extremity. Its inner surface *p q* attains a red heat in contact with flame, and consequently the air passing through becomes heated. Entering at a speed which is regulated by means of dampers, this air makes its way to the upper part of the furnace; and mixing intimately with the spray of tar and steam ejected from the pulverizer, ensures regular, rapid, and continuous combustion. The tar is ignited at the moment of emission, and burns like a large flame of gas. The pulverizer is placed in the centre of a round opening, about 2½ inches in diameter, made in the front of the setting. This allows of the circulation round the appliance of a current of auxiliary air, the effect of which is to assist combustion, and also to insure that the metal does not become too hot. The quantity of water necessary for the production of steam to supply the injector is from 18 to 22 gallons per hundred weight of tar employed—a very low figure, and accounted for by the fact that the end situated in the furnace forms of itself a steam superheater, without the addition of any accessory appliance. The expenditure of tar is about 9 per cent. of the quantity of coal carbonized.

Certain precautions have to be taken when starting the appliance.

The operator should begin by injecting steam, which should be allowed to flow alone for a few seconds; then the necessary supply of tar should be admitted, and the quantity of steam regulated. The workman will soon see when the regulation is satisfactory, by the tar being completely pulverized at the outlet of the injector, and by there being a scarcely appreciable increase in the quantity of residual coke on the floor of the furnace.

In order to ensure the complete elimination of any impurities in the tar, in addition to the strainer with which the tar tank is furnished, there is fixed above the funnel *E* on the supply pipe a chamber *F*, wherein is a central diaphragm formed of wire gauze of a close mesh, through which the tar has to pass before it falls into the funnel, and so on to the furnace. This chamber likewise serves to reduce the rate of flow of the tar, the supply of which is regulated by the two cocks *D D*^{1}, between which it is situated. In working, combustion is complete; and as, with the tar firing, there is no formation of carbon on the retorts, the heat is more effectually transmitted to the coal to be distilled than in the case when coke firing is adopted. At Guise, with M. Grébel's system, there is an increased production 2 cubic meters, or about 70 cubic feet, per 100 kilos. (220 lbs.) of coal carbonized.

To briefly sum up the advantages claimed for the system here described, it is simple, inexpensive, applicable to all kinds of settings, and facilitates regularity in the operations of the retort house. There is no difficulty in the way of its employment with regenerator furnaces; and therefore it would be interesting to make a trial of it with them. At Guise they reckon the consumption of tar as being about 9 per cent. of the total weight of coal carbonized; while the daily consumption of coke was about 13.33 per cent. The following are the actual figures per diem:

Coke: 700 kilos., at 28 frs. per tonne.....	19f. 60c.
Tar: 472.500 kilos., at the same price... ...	13 23
Saving effected.....	6 37

The ratio of the consumption of tar to that of coke being as 9: 13.33, it may be concluded that it would be advantageous to fire with the former, so long as the prices of the two combustibles were not in inverse ratio to each other. But the employment of tar as fuel necessitates a consumption of a certain quantity of water; and this forms an additional item of expense, of which it is necessary to take account, unless in the production of steam the waste heat from the furnaces is utilized. At Guise this represents 1 fr. 13 c.; and therefore the actual saving effected is reduced to 5 frs. 24 c. Of course, it is for each manager to determine whether it will be more economical for him to use tar in preference to coke in heating his retorts; and his decision will depend upon the relative market values of the two products. But should he fix upon the former fuel, the system here described may merit his attention in connection with others that have been introduced to his notice.

Protection of the Human Body from Dangerous Currents.

Mr. P. B. Delany presented this subject to the American Institute of Electrical Engineers in the following words:

Since the object of reading a paper before this society should be the enlightenment of members on the subject under consideration by the presentation of facts developed by experimentation or of theories supported by a reasonable amount of investigation, I must apologize for my delinquency in both respects, and trust to the kind indulgence of the society in making a few suggestions with a view of eliciting information and opinions from those whose experience and familiarity with the subject enable them to speak with authority.

I allude to what are considered dangerous currents and their effect on the human body. That there is danger in handling conductors conveying high tension currents must be generally admitted. The question, therefore, is, can fatal results from such currents be wholly or partially averted? All will agree that with proper care on the part of the companies and intelligent co-operation on the part of employees, but little would be heard of the danger of electric currents. But companies are economical and employes are careless. Familiarity with danger breeds contempt for it. This is exemplified almost daily in every department of industry. A new man in a powder mill will exercise the greatest care and observe all the rules of the establishment faithfully. In a few months the same man will smoke a pipe over an open powder keg.

Protection is necessary principally for those who through carelessness or ignorance fail to protect themselves. It has been claimed that there can be no such thing as an accident—that nature has none, and that all so-called accidents are simply the results of miscalculation, bad judgment or carelessness. But it must be remembered that the vigilance of the most alert will sometimes relax, and this to them is the moment of danger.

Realizing that something should be done to protect dynamo men and wire handlers from injury from powerful currents, I, a few years since, invented a device for shunting the vital parts of the body. Partly on account of a pressure of business in other branches of electricity, but principally owing to a hesitancy in bringing out a device about the efficacy of which there seemed to be some doubt, its introduction to scientific criticism was delayed until a few weeks ago. As the references made to the question in the electrical papers have failed to elicit an expression of opinion satisfactory to any degree, it has been deemed advisable to bring the subject before this meeting.

The question to be determined is, to what extent a wire of practically no resistance, extending from one wrist to the other and bound around the wrists in numerous convolutions, so as to make good but not uncomfortable contact, will protect the vital parts of the body from fatal injury when it is placed in the path of a dangerous current through contact at the hands. It is claimed by some that the current having once entered the muscles, veins and tissue at the hands, will not leave the arms at the wrists and follow the shorter path of the wire, but will confine its course to the arms and body alone. The other opinion is that the greater portion of the current received at the hands will leave the arms at the wrists and follow the wire. The problem seems a difficult one to solve. So much depends on the condition of the person at the time of receiving a shock, a large number of tests would be necessary to arrive at results which would afford a safe basis for calculation. A few years ago Dr. Stone, connected with one of the London hospitals, made a series of interesting experiments upon patients afflicted with various ailments, with a view of determining whether or not fluctuation in their physical condition affected the electrical conductivity or resistance of their bodies. The results proved, according to my recollection, that great changes took place in the electrical resistance of the patients experimented upon from day to day, and that there was a direct influence manifested by the rise and fall of different diseases upon the electrical conductivity of the body as a whole or in part. An account of Dr. Stone's experiments was published in *Nature* at the time. But while the experiments were most valuable for the purpose for which they were intended, they throw but little light on the subject of dangerous currents and protection from fatal injury.

Last September, there was published in the *Electrical Review*, of London, a paper on "Shocks from Alternating Currents," by Mr. G. L. Addenbrooke, who for some time previous had charge of the Grosvenor Gallery installation, where a primary current of 2,500 volts was constantly employed. While no one had ever come in contact with both mains at once, the writer stated that even if such an accident had happened he was "by no means prepared to assert that the result would undoubtedly be fatal." Indeed," says he, "I rather incline to the opinion that if the subject of the shock were healthy, and the circumstances under which he received it were favorable, the chances are he would survive."

I cannot make out what Mr. Addenbrooke means by receiving 2,500 volts under favorable circumstances. It seems to me, if they are received at all, the circumstance could not be other than unfavorable. Mr. Addenbrooke himself received a severe shock, and as he speaks from experience, I quote his account of how it affected him: "The primary effect of the passage of the current through the body is, of course, to contract the muscles. The amount and persistence of this contraction depend on the quantity of the current flowing, or, as it is usually designated, *the intensity* of the shock, and varies from a simple twitching of the limbs to complete and intense contraction or rigor of apparently every muscle in the body. In this latter case, the current completely supersedes the action of the mind over everything capable of contraction or movement. Consciousness, however, is apparently rarely, if ever, lost, though the subject may be entirely unable to make any motion, cry out, or do anything to help himself. If aid is not near, such a state may be maintained for some time. On release from such a position by extraneous or natural causes, the subject is usually dazed, but if at all unconscious, soon recovers completely and experiences no further functional disturbance than the debility and nervousness naturally following such a severe strain on the system." While admitting that fatal shocks are possible, this gentleman gives it as his opinion that "if the shock is not sufficient to cause instantaneous collapse, apparently the body can bear the strain of the continued passage of the current for some time, and that death is caused by paralysis of the involuntary muscles controlling the heart and lungs, and that the preliminary stages of total collapse are analogous to what occurs when drowning." Referring to the local action of the current on the body where it enters and

leaves, this writer also says: "If the contact is good, that is, if it consists of a good area, say of over a couple of square inches of a fairly motst skin pressed with moderate firmness against a metallic body or other good conductor, no visible injury may result. For instance, a man will often get burnt about the hands, but his feet, by which the current leaves, will be unaffected, or only slightly reddened or inflamed. Burning of the hands or other parts of the body will occur when there is imperfect contact of the body with the conductor, coming in contact with a bad or semi-conductor, such as a dirty or carbonized surface. The burning is caused by the absolute setting up of an arc."

It seems to me this gentleman's views, based, as we are led to believe, on actual experience, are somewhat paradoxical. And surely numerous cases of deaths from currents recently, disprove many of Mr. Addenbrooke's deductions. True, nothing short of death is made public, so that there is but little information to go upon relating to the instances which must be of frequent occurrence where men are *almost* killed by electric shocks. In all cases that have come to light, whether simply injuries or cases of death, the parts of the body coming in contact with the current have been badly burned. The unfortunate "trouble hunter," who lost his life a few days since, was not only burned at the hands but at the knees. In cases where the shock is not instantly fatal, may it not be that the burning of the flesh at the points of contact is so great as to destroy to a considerable extent the conducting substance in contact with the wire, and thereby cause a fall in the current passing through the body? It is certainly owing to the fact of the body being a very poor conductor that the harm is done. If it offered no resistance there would be no realization that a current was passing through it. An arc would be created at the point of contact, provided the contact was *imperfect*, but the body itself would be uninjured. It seems to me that the human body must be viewed as any other semi-conductor, with the exception perhaps of susceptibility to greater change under the continued action of a current owing to the fluids which it contains. It is owing to its resistance that a carbon filament becomes incandescent.

The carbon rod of an electric lamp is not consumed except at the point where the arc is formed by the resistance of attenuated particles under combustion. Any conducting substance placed in the path of more current than it is capable of conveying must be heated, consumed or decomposed, according to its nature and in proportion to the discrepancy between the conducting capacity of the conductor and the sum of the current.

Now if we liken the human body from hand to hand to a canvas hose or tube filled with water and which allows a certain quantity of moisture to ooze through the surface, corresponding to the moisture of the skin, and if this be inserted in a circuit, connection being made at the extreme ends, corresponding to the hands, and a shunt of wire of minimum resistance be wound around the tube two or three inches from the ends, corresponding say to the wrists, we can, perhaps, more understandingly speculate on the action of a dangerous current on the human body, contact being made at the hands and the shunt wire encircling the wrists. It should be borne in mind that the contact between the shunt wire and wrists is much better than the contact at the hands, since the wrists are more tender than the hands. Now referring to the tube and assuming that the contacts at the ends have improved by reason of the current eating its way into the water, does it not follow that the current instead of following the entire length of the tube of water, offering, say thirty times the resistance of the two or three inches of water from the end of the tube to the shunt wire, and several thousand times the resistance of the shunt wire itself, will, to a great extent, pass from the tube to the shunt wire and in its passage *improve* the contact at that point as it did at the ends in entering the tube? I have often noticed that upon receiving a shock of 150 to 250 volts profuse perspiration instantly followed. This would greatly improve the contact at the wrists above the normal, so that it would seem impossible that the current should confine itself to the fluids and muscles of the body in preference to the wire when separated from the wire only by this tender skin filled with moisture.

In considering the danger point of currents it seems reasonable to recognize the same law, or rather recognize the absence of any law, governing other destructive agencies. Let it be concussion, strain, asphyxia, poison, or other enemy of endurance, there are hardly two cases alike. One man may emerge with but slight injury from a cause which to another man would be death? Why should it not be so in the matter of electric shock? Death, of course, must be the consequence of a certain degree of cause. If 2,000 volts are necessary to kill in any instance, one volt less would avert death, while shunting 100 or 500 volts would leave a proportionate margin of safety. Fatal results through the medium of electricity do not come by jumps any more than by any other force or element of destruction. There is in this subtle agency, as in all others, a last straw which breaks the camel's back—a last volt which does the final harm. Hence the importance of protecting, as far as possible, those exposed to this danger.

Regarding the immediate cause of death or the effect of currents on the substance of the body, we must look to the medical men for light. Probably all subjected to shock might not be similarly affected. In one case it might be the heart, in another the brain, and in others the lungs that might be injured. Why not have a thorough investigation on this subject, and then perhaps wire handlers may be subjected to an examination before they are allowed to engage in such work, just as men are examined for various other duties.

[Prepared for the JOURNAL.]

A Visit to Beckton Gas Works, London.

By NORTON H. HUMPHRYS.

Having enjoyed the privilege of forming one of the party who, as members or friends of the Gas Institute, were courteously and hospitably received by the Gas Light and Coke Company, and allowed to look over the Beckton Gas Works, on the 13th of June, I propose in this article to give a few general particulars of my own observations for the benefit of the readers of the AMERICAN GAS LIGHT JOURNAL, many of whom are never likely to see this gigantic undertaking for themselves. In using the word "gigantic" let me at once guard against possible disappointment by saying that the gas plant proper—the retort houses, condensers, purifiers, meters and holders—has no special claims to notoriety in respect to size. They have all been outstripped in this respect by other gas undertakings. The Beckton works are not one large gas works in the ordinary sense of the word, by which we might expect one retort house of brobdignaggian proportions, with condensing, purifying and storage plant to match. No. They consist of a series of 12 gas works, each as distinct from the others in practical effect as if they stood on separate plots of ground. In actual fact the condensing and purifying plant is rather intermixed, being so spaced out as to occupy the ground to the best advantage. But the gas from section No. 1 does not intermingle with that from No. 2, or any of the others, although the irregular shape of the ground has forbidden the practicability of following any regular plan of arrangement in respect to the condensing and purifying plant.

The Beckton gas works are now about 20 years old, having been first opened, I am told, in 1868. They are situated on the north side of the river Thames, about 10 miles below London Bridge, and at a somewhat greater distance from the fair center of the district which they assist in supplying. The site is very low and flat, and has been described as "little better than a marsh." The facts that the foundations of all the buildings are carried down to a depth of from 20 to 30 feet, and that a heap of coal placed on the virgin soil sank down a depth of 3 or 4 feet bodily, seem to show that this description is not far from correct. The engineer who first conceived the plan of placing an enormous gas factory on this waste piece of land is the late Mr. F. J. Evans, who designed the general arrangement of the works; and the architectural and constructive details were carried out by Mr. V. Wyatt. The present demands of the customers of the Gas Light and Coke Company are about 17 thousand millions cubic feet of common gas, and 600 millions cubic feet of cannel gas per annum. The total productive capacity of the Beckton works is stated to be 36 millions cubic feet per day, so that, if so desired, the Company can provide one-half of the total demand for common gas, or more, at these works.

The special features comprise, in the first place, the really magnificent transit system, comprising a high level railway line of the usual gauge, extending along each side of all the retort houses, and a low level system carried into all parts of the works, in conjunction with a large T-shaped jetty on the river, and also with the system of a local railway company, who have found it well worth while to extend a special line and establish a special station at the entrance to the works. The whole forms a complete system for the export or import of materials by water or by rail as may be more advantageous. Next we must notice the large chemical works, which are entirely apart from but adjoining the gas works, and are large enough to deal, not only with the whole of the tar and the liquor produced on the ground, but also with that from the other stations of the Company. A third point is the excellent arrangements for the care and comfort of the workpeople. The retort houses are wide and lofty, and the ventilation at all parts of the works is simply perfect. Not only have the Company erected a row of cottages for their convenience, but there is a bath room and reading room in connection with each retort house. There is a canteen under certain regulations where whole-

some food and pure drink is provided at cheap rates. And in many other ways the evidence of assiduous care for the well being of the workmen is discernible. The fourth item I have to mention is worthy of notice rather on account of novelty than of intrinsic importance. Instead of the usual gutter and downfall pipes for the removal of rain collected on the roofs, a narrow cast iron tank is placed just below the eaves in the retort houses, extending the whole length, and of sufficient capacity to retain any reasonable amount of rainfall. They, therefore, act the part of high pressure cisterns from which water can be supplied to the retort houses, or any part of the works, under pressure, and contribute in a great measure towards saving the expense of pumping.

Landing on the jetty, and making his way to the central point thereof, the visitor finds himself in a good position for forming some idea of the magnitude of the operations carried on. Three lines of rails extended from end to end, and on each side are six cranes. The jetty is long enough to take two coal vessels, end to end, on the outside, and two on the inner or shore side, and these can all be unloaded together, three cranes working at each vessel. The cranes are actuated by hydraulic machinery, driven in its turn by steam power, but the whole of the engines, boilers, etc., are out of sight, being contained on a substage. From the center of the jetty the viaduct is carried to land, where it is divided into four branches. The retort houses are ranged in a double row, one end of which faces the jetty, so that we have directly in front of us the ends of two retort houses, having some space between them. The viaduct is supported by elegant standards of cast iron at a height of 22 feet or so above ground level. A branch enters at each side of each retort house, and is continued right through, end to end, the whole series of houses. The space beneath it inside the houses serves as a coal store from which the stokers can serve themselves as they require, and the space beneath the viaduct, but between one end of a retort house and the next, can be utilized for storing coals. The double row of retort houses extends back in a straight line from the jetty through three houses, then it turns through an angle of about 45° to the left, and continues in a straight line through the remaining three. The low level line extends along the ground at each side of the retort houses, and there are also lines of rail through the coke vaults. At suitable intervals there are inclined planes communicating with the high level system, so that coal brought by land may be conveyed up to it.

The retort houses are all fitted with stage floors 8 feet above ground level. The order throughout is double settings, occupying the central line of the house. Eight of the houses contain 30 double beds each, and four contain 40. Either eight or nine retorts are set in each bed, so there is a total capacity of 6,000 to 7,000 single retorts. The line of retort houses from the jetty up to the far end would be about 1½ miles long, and the actual retort frontage is about 1.8 miles. They are all uniform in design, and present a very elegant appearance, being built of yellow-gray bricks, with facings of red bricks and mouldings, etc., of red terra cotta. The condensers are of the plain horizontal type, and the liquid purification apparatus comprises sets of Mann & Walker's scrubbers, Walker's washers, and the "Standard" scrubber-washer. The system of dry purification followed is of a very elaborate character, owing to the stringent regulations under which the Company labor in respect to sulphur compounds. The plant for each section comprises three sets of square purifiers, each set comprising four vessels, and a single or check purifier, making 13 in all. The first set are charged with fresh lime, and are used for the purpose of completely removing carbonic acid, the gas being always free from that impurity on arriving at the outlet of the last vessel. The second set is charged with lime, sulphuretted by allowing the foul gas to pass through it, after the carbonic acid is removed, and the purpose served by them is the removal of a part of the sulphur compounds, so that the quantity remaining in the gas may not exceed the limits imposed by the Gas Referees. And the third set are filled with oxide of iron, and are used for the removal of sulphuretted hydrogen. The check purifiers are charged with lime. These are round in shape, about 40 feet in diameter, and 6 feet deep. And the other purifiers are square, about 35 feet each way by 5 feet deep. The lids throughout are lifted by hydraulic power. A powerful ram or plunger is contained in the center of each vessel, so that when desired the lid can be pushed up and lifted vertically to a height of 6 feet or so. In this position it leaves plenty of room for workmen to enter from the sides, and also acts as a sort of roof protecting them from the weather. The whole of the purifying vessels are situated in the open. They are mostly arranged in rows, having buildings for containing the oxide or lime on one side, and a line of rails on the other, so that the spent materials can be loaded directly into trucks.

The exhauster houses are elegantly arranged, and the machinery is kept in beautiful order. Each house is capable of dealing with the gas from four sections. It is fitted with six exhausters (each having its own driving engine, of the horizontal condensing type), of which four are continually in use, the remainder being ready for use as duplicates in case of a breakdown. Some of the exhausters most recently erected are really splendid machines, capable of dealing with 300,000 cubic feet of gas per hour. There is also a set of exhausting machinery for propelling the gas on its way to London. The storage capacity at Beckton is not sufficient to take the whole of the make, the total contents of the eight gasholders being only about 10 millions; so that a considerable portion is sent away to storage stations in various parts of London, perhaps 10 or 12 miles off. It is conveyed through two separate sets of trunk mains, each 4 feet in diameter, receiving a push on, so to speak, from the pumps at the Beckton end, and also being drawn by exhausting machinery at the storage station. By this means the pressure in the trunk mains is maintained at a moderate rate in all parts.

I can only give a very rough idea of the numerous subsidiary buildings. There is a handsome clock tower, offices for the engineers and draughtsmen, detatched residences for the Superintendent and his deputy, foundries, smith shops, lathe shops, etc.—all filled with modern machinery, including such things as steam hammers; a carpenter shop, where grids for the purifiers are made by machinery; a set of lime kilns, where the lime for the purifiers is burnt; a shed for the locomotives, stables for the horses employed on the works, accommodation for a steam fire engine, and a full staff of firemen, etc., etc.

The chemical works cover a large area of ground, but are arranged throughout in a very orderly manner. The tar stills, numbering 40 to 50, are set in one long row, having on one side the pitch receiving boxes and trays, and on the other the coolers and tanks for receiving the various products. Here the tar is separated into light oil, carbolic oil, creosote oil, anthracene oil, and pitch. There are also buildings where the manufacture of pure naphthaline (albo-carbon), the marketable qualities of anthracene, and other refined chemical products are carried on. The sulphate plant comprises a series of sulphuric acid chambers, also arranged transversely in a row, having a row of furnaces on one side and a row of sulphate plant on the other. The space beneath the chambers is used for drying and storing the sulphate. The whole of the spent oxide produced at the works of the Company is utilized at this point for the manufacture of sulphuric acid, to be used in the manufacture of sulphate of ammonia. In connection with the sulphate works the use of centrifugal drying machines, which renders the salt from the draining board sufficiently dry for bagging in a very few minutes, may be noticed.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

THE Ball Engine Company, of Erie, Pa., still keeps on taking contracts for steam plants with that equanimity which is said to spring from success. Among the orders recently received we may note the following: The Trinidad (Col.) Electric Light Company, in order to keep pace with the demands from consumers, has determined to put in an additional Ball engine. The Paterson (N. J.) Electric Light Company (Thomson-Houston system) has almost completed the construction of its station—the proprietors of this Company say that their station will be the best equipped one in the country—and the steam power provision therein is certainly on a magnificent scale. It is to consist of five 125-horse power boilers, with an equal number of 100-horse power Ball engines. The Thomson-Houston system of arc lighting is to be used hereafter in the public lighting of Rome, Ga., and the Ball Company is to supply the steam plant therefor. The Company will furnish like equipment for the Atlantic City (N. J.), and the Newark (N. J.) Schuyler Electric Light Companies. The City Gas Light Company, of Norfolk, Va., is about to install the Thomson-Houston system of arc lighting, and the Ball folks are to furnish the necessary steam and power plant.

ANOTHER DAMAGES VERDICT.—Something like a year ago a break occurred in one of the Boston Gas Light Company's mains in Hanover street, and before the break was repaired the gas had entered several tenements along the line of the street. Jas. Ryan, an inmate of one of the dwellings, claimed that the escaping gas so affected him that he became quite ill (he was asleep, or at least he so claimed, at the time the gas penetrated his apartment), and subsequently brought suit for damages in the Superior Court against the Boston Company. We are not certain that the case was tried on its merits, but in any event, either as the result of a decision in his favor or because of a compromise—probably the latter—the suit was terminated by the payment of $2,000 to Ryan by the defendant. Possibly Mr. Ryan may be inclined to take his chances in another accident of a like nature; and should he so elect,

he ought to be careful to interview the Gas Commissioners in order that he may not make the mistake of "taking his chances" along lines of mains licensed to carry a gas having a high carbonic oxide content.

ANOTHER NEW JERSEY CHARTER.—This time it is the articles of incorporation of the American Construction Company that have been filed with the County Clerk of Camden, N. J. The incorporators are Messrs. P. A. B. Widener, W. L. Elkins, and D. H. Lane, all of the Quaker City. The authorized capital is $100,000, with $1,000 paid in. The objects of the Company are "to construct, equip, and furnish gas works with the necessary apparatus for furnishing gas."

MR. CHAS. B. COOPER, of the Citizens Gas Light Company of Louisville, Ky., is no longer a bachelor, having, on the evening of June 28, been united in marriage to Miss Amy Hyatt.

AT a special meeting of the Rome (N. Y.) Common Council, two proposals for lighting that city by means of arc lamps were opened and read. The Mohawk Valley Electric Light Company offered to perform the work, for a period of 5 years, at the rate of 34½ cents per light per night. The Rome Gas Light Company wanted 36 cents per light per night, on the basis of a 3-year contract, but would take 33 cents in case the term was extended to 5 years. The latter proposition was accepted, and the City Attorney was instructed to draft a contract in accordance therewith.

AT a meeting of the Village Trustees, the West Troy (N. Y.) Gas Light Company was awarded the contract for maintaining, lighting, and repairing the public lamps, on the following basis: 244 gas lamps, at $1.80 per lamp per month, and 91 naphtha lamps, at $1 per lamp per month, lamps to be lighted 25 nights each month, and kept alight 9 hours per night.

SUPT. HEEFNER, of the Goshen (Ind.) Gas Light Company, writes us that, after a careful study of the matter, it has been determined to place, with Mr. Henry Pratt, of Chicago, an order for a double set of his patent generators, scrubbers, washers, condensers, purifiers, boiler, engine, blower—in fact all the plant necessary for an entirely new and first-class gas works. The Goshen folks evidently have faith in the stability of the light of the present; and they are like very many others in this respect.

ANNUAL MEETING, NEW CASTLE, DEL.—At the annual meeting of the New Castle Gas Company, held a fortnight ago, the following Directors were chosen: Messrs. T. T. Tasker, Sr., S. P. M. Tasker, Jas. G. Shaw, Wm. Herbert, and Elmer W. Clark. The Board organized by electing T. T. Tasker, Sr., to the Presidency, and selected W. H. Clark to be Secretary and Treasurer. The Company had a very prosperous year, although the uninitiated might not think so, judging from the fact that the usual dividend was passed. The decision was reached, however, to retire a considerable portion of the bonded debt, which payment was made out of the season's earnings.

THE dollar rate at Spencer (Mass.) seems to have found great favor with the residents. During the last fortnight in June 30 cooking stoves were installed, and the Company had orders to place 50 more. This tells the story of the possibilities involved in cheap gas in our Eastern cities and towns, and tells it plainly, too. The placing within 30 days of 80 gas cooking stoves in a town containing not over 7,500 inhabitants is little short of marvellous, although not so much so after all when one remembers that anthracite coal is probably worth $6.50 a ton at Spencer. Gas at $1 per thousand beats that away off in the matter of economy.

AN ODD THEFT BY A PARSON AND A BRACE OF DEACONS.—The ungodly in the pretty little hamlet of Turtle Rock, Westmoreland county, Pa., have been merrily wagging their irreligious tongues ever since the last Tuesday in June. A day or so before that date the church people held a strawberry festival, which did not terminate until long after nightfall. The Rev. Mr. M. M. Sweeney, Pastor, and Deacons Alexander Watson and Andrew Lane, knowing that the darkness ought to be turned into light, and also in the knowledge that the mains of the Pennsylvania Natural Gas Company passed close by their church, concluded to have a grand illumination, and so tapped the Company's pipes without consulting the owners of the latter. The festival was voted a grand success, particular stress being laid on the *eclat* given thereto because of the illumination; but the day of reckoning came. The aforesaid Pastor and Deacons were arrested on the charge of stealing gas, and the delinquents were brought before Judge Crupp, who discharged the Pastor, but held the Deacons in $500 bail to answer.

ANNUAL ELECTION, MILWAUKEE, WIS.—The annual meeting of the Milwaukee Gas Company was held, in the office on East Water street, on the morning of the 2d inst. The following Directors were chosen: Messrs. E. H. Brodhead, H. H. Button, Elias Friend, J. E. Friend, J. Johnston, T. A. Greene, A. L. Cary, E. E. Dewey and Jno. L. Mitchell. The Directors selected the following officers: President, H. H. Button; Vice-President, Jno. L. Mitchell; Secretary, G. Kremers. Executive Committee, E. H, Brodhead, Elias Friend and Jno. L. Mitchell. The concession in gas rates (20 cents per thousand cubic feet) determined on at the January meeting, notice of which appeared some time ago in our columns, went into effect on the 1st inst.

THE Trustees of the Wheeling (West Va.) City Gas Works have organized the employees (stokers, engineers, etc.) into three shifts on an 8-hours' run. No decrease has been made in the per diem rate of pay. The rule is to remain in force during the months of July, August and September.

THE New York Contract Company and their constructing engineer, Mr. W. H. Hayden, are to be congratulated on the energy with which they prosecuted the task of erecting and equipping the gas works at Anniston, Alabama. In fact it is an open secret that certain parties interested in annulling the franchise (or ginally granted, we think, to Mr. T. Gardner Foster, of Montgomery) were quite certain that the Company's powers would lapse because of the inability of the grantees who had purchased the Foster charter to be in position to supply gas on or before the 9th inst., on which date the city would have been released from its pledge to take a certain number of lamps for a specified time and price. However, the Contract Company, aided by willing work on the part of Secretary Reed and Engineer Hayden, got right down to business. Ground was broken on April 10, and the city's lamps were lighted up with gas on the 30th of June. Pretty quick work, that.

WE understand that the Lincoln (Neb.) City Council, at a special meeting held last month, passed an ordinance regulating the price of gas at an all round figure of $2 per thousand cubic feet. It also providss that anyone can retain a gas meter on his premises for an indefinite time, when not using gas, by simply paying a rental of 25 cents per month for the instrument. Under the old ordinance those who did not consume 1,000 cubic feet of gas per month were obliged to pay $3. That is, no monthly bill less than $3 was rendered.

ANNUAL MEETING, EXETER, N. H.—At the annual meeting of the Exeter Gas Light Company the following officers were elected: Directors, F. H. Odiorne, S. Hatch, A. P. Browne, W. Burlingame, A. M. Copp; Treasurer, A. M. Copp; Clerk, A. F. Cooper. For the first time in many years Exeter is represented in the Board of Directors, and we are of the opinion that Mr. Burlingame's election will act as a stimulus to local interest in the Company. During the year 442 tons of bituminous coal and 40 tons of cannel were carbonized; the main system was increased by the addition of 2,980 feet of pipe; 10 new street lamps were erected. The quantity of gas accounted for was 4,074,520 cubic feet.

IT seems that the Indianapolis (Ind.) division of the Welsbach Company family is to be operated independently of the skillfully, albeit somewhat noisily, advertised fountain head or Parent Company. Whether or not the Indianapolis offspring refuses to pay tribute to its progenitor is, of course, of little interest to the gas maker, save in that, if the Indianapolis folks are going to work on their own behalf, we may expect, within a somewhat reasonable space of time, to have specimens of the Auer von Velsbach burner placed in the hands of ordinary gas consumers, who will submit them to the everyday description of trial. We do not wish to say one word against the value of this burner—in fact the first mention made in America of Dr. Auer's discovery was given in our columns—and acknowledge that all the tests so far reported show remarkably in its favor, but we would like that confidence in their utility which can only spring from a knowledge that the results of everyday practical use approximate somewhat closely to those recorded in laboratories presided over by trained minds that directed precise and careful manipulation. Our hint as to the possible independence of the Indianapolis Company is afforded in the following from the Indianapolis *News*: "The Welsbach Company, of Indianapolis, is the name of the new Company which will manufacture the apparatus required in the Welsbach incandescent gas burners. The members of the Company are Jno. W. Murphy, Jno. P. Frenzel, Henry Jameson, Julius F. Pratt, Jno. Caven, H. J. Milligan, J. B. Mansur and James H. Failey, and all are included in the Board of Directors except the last named. The corporate stock of

the Company is placed at $400,000, and the manufactory and chief offices will be in Indianapolis."

CHANGE IN THE FIRM.—Mr. James R. Floyd, the sturdy and level headed proprietor of the famous old Oregon Iron Works, the name of which is like a household word to the fraternity, has just furnished another neat bit of evidence that those who are faithful to him can always count on being rewarded. His sons, Fred. W. and Henry E., two youngsters of whom their father may well feel proud, after a practical apprenticeship that thoroughly fitted them for the acceptance of added responsibilities, were received into full partnership with him on the first inst. The firm name accordingly has been changed to the following: "James R. Floyd & Sons, Proprietors Oregon Iron Works." May their new signboard have taken on a very weather beaten appearance ere the necessity arises for a change in the lettering on its face.

ANNUAL ELECTION, KANSAS CITY, MO.—At the annual election of the Kansas City Gas Light and Coke Company the following executive management was chosen—we might have said with greater appropriateness, re-elected: President, M. J. Payne; Secretary, Walter Woolcott; Superintendent, Walton Clark. The light of the present holds its own at Kansas City in pretty tenacious style; and President Payne intends to keep up the grip.

THE Waterhouse Electric and Manufacturing Company has completed the electric plant which it was authorized to construct at Joliet, Ills. So far its working is reported to have been satisfactory in every respect.

Mr. Francis A. Peters, President of the Webster Bank, Boston, Mass., has been chosen President of the Jamaica Plain Gas Company, vice the late Mr. Jno. C. Pratt.

THE lessees of the Vicksburg (Miss.) Gas Light Company evidently have faith in the stability of Vicksburg's future, for they are now engaged in extending their main system into that part of the city locally known as "Speed's Addition."

THE Stratford (Can.) Gas Company has often "pointed with pride" to the very diminutive gas engine (one-man power) which a local merchant (Mr. D. A. H. Ahrens) has been operating on his premises for some time back. Now, however, the Company is desirous of "pointing" to another and greater machine of a like nature which it proposes to operate on its own account. We have had occasion hitherto to note that the Stratford Company was about to engage in the supply of electric light, and that it was proposed to utilize, at least in measure, water power for driving purposes. Since then it has been determined to install a 50-horse power gas engine (Otto type), to work as an auxiliary motor, and the contract for the engine was awarded to the Crossley Bros., of Manchester, England. The engine weighs 8½ tons, and is rated to an exceptionally high speed.

THE Lincoln (Neb.) gas ordinance, briefly alluded to elsewhere, affords an example of how thoroughly mean a Common Council can be, even in a "great and growing" city—with an accent on the "growing," mind you. Perhaps if we allow President Walsh, of the Company affected to tell the story the meanness of the Lincoln City Fathers will be made quite plain. He said: "I had attended a number of meetings of the Council, and the members of that body knew I wanted to be heard when the ordinance came up. To pass it at a special meeting held during my absence does not seem to be exactly the fair thing. The ordinance is unnecessary and unjust. When the electric light was put in we reduced the price of gas to as low a figure as it can be produced with profit in this city. Our prices were $2, $2.25, and $2.50; and there can be no doubt that the principle of a sliding scale is perfectly just and commercially fair, for in every other business a reduction is made to a wholesale purchaser. Is it not fair to charge a consumer more who consumes only 100 cubic feet per month than one who uses 10,000 cubic feet in the same time? Does it not cost a company more in reality to collect payment for the smaller than the larger quantity? This was not thought of by the Council, evidently, for by the new law the price is put at $2 to all ordinary consumers, and at $1.75 for gas used for engines. This rate is altogether too low." [Here President Walsh instances several places within certain limits of Lincoln in which the price of gas is either at the same rate or higher than in Lincoln, and then goes on to say: "We pay more for coal than is paid in Omaha, and as much as any of the cities I have named. Again, we have long stretches of mains from which little gas is taken. On our East O street main, and on the South Seventeenth main as well, the amount paid us by consumers does not pay the interest on the pipes we have in the ground, to say nothing of the cost of the gas. In a large city the cost is much less in proportion than here, and the product can be sold for less. The new rates are unjust to the Lincoln Gas Company;" to which we will add, Mr. President, that they were imposed in a completely contemptible manner.

WE understand that the Pawtucket (R. I.) Gas Company, mainly through the sensible mediation of Superintendent Stiness, has arrived at an understanding with the city authorities in respect of the contract for public electric lighting in that city. Under the agreement recently made the Gas Company will, for one year, furnish full candle power arcs (in the ordinary districts of the city), at the rate of $120 each, the same to be extinguished at midnight; while in the central part of the city, 50 arcs are to be maintained, every night and all night, at the rate of $150 each. The authorities early this spring seemed to be extremely anxious to construct and operate an electric lighting plant on public account, and used that argument as a club wherewith to coerce the Gas Company in the matter of prices for the current year. Now, while it must be admitted that the Company did shade its rates a trifle over those which prevailed last year, and the local magnates are in high glee over their "successful effort to save the city's funds," we fail to see why Superintendent Stiness should feel greatly cast down at the net general result. We have heard it said before that the Sage of Pawtucket does most of his angling in the late afternoon; but, either early or late, his lines can usually be depended on to land the game.

THE charter grabbers of Massachusetts are anxious to secure permission from the Selectmen of Swampscott to establish a gas works in that town. This time the grabbers are masquerading under the title of the Standard Company, and, of course, have control of a new process of gas making, which is infinitely superior to anything hitherto seen in the Bay State. We have an idea that the Standard Company will not cause any loss of sleep to Mr. Prichard, of the Lynn Gas Company, which now supplies gas to Swampscott through a well balanced system of mains. And we think Mr. Prichard will keep his ease, because the Swampscott Selectmen are acquainted with the exact weight (financially and otherwise) of some of the parties who are interested in the "Standard" movement.

ANOTHER Eastern Company with a process was incorporated, in Maine, towards the close of last month. The company was organized in Gardiner, with a capital of $1,000,000, of which amount $206,500 is said to have been paid in. The stockholders include Messrs. M. R. Williams, Hackensack, N. J., Dewitt Stearns, Des Moines, Ia., Jno. Claffy, Brooklyn, N. Y., Jno. T. Rowland, Jersey City, N. J., and Franklin Everhard and Alfred King, New York city. Its officers are: President, M. R. Williams; Treasurer, F. Everhard; Directors, Dewitt Stearns, F. Everhard, M. Williams, Alfred King and Jno. Claffy. The Company was organized under the general laws of Maine.

IN our note in last issue, respecting the June visit of the Guild of Gas Managers to Pawtucket, R. I., we omitted to mention that a most entertaining feature of the session was the delivery of a lecture, by Prof. S. C. Hathaway, Jr., to the Guild on the subject of "Photometric Standards." The lecture room was the office of the Pawtucket Gas Company.

THE report of Inspector Caldwell, on the quality of gas distributed in St. Louis, Mo., during the week ended June 30, shows that the St. Louis Gas Light Company's product averaged 18.72 candles, while that sent out by the Laclede Company equaled 18.59 candles.

THE Chelsea (Mass.) Gas Company expected to light up Chelsea's streets last night from its electric annex. The construction work must have been energetically prosecuted to admit of this result.

RE-BAPTIZED.—The Globe Construction Company, incorporated by P. A. B. Widener, W. L. Elkins and D. H. Lane, filed articles at Camden, N. J., early this month. This is virtually a change of name on the part of the American Construction Company, the incorporation of which is noted elsewhere in these columns.

BACK AGAIN.—Mr. Jas. G. Miller, formerly in charge of the plant at Green Bay, Wis.—he was also interested in the Fond du Lac and Marquette works—has been prospecting at De Pere, Wis., with a view to constructing and operating a gas works there. The people of De Pere have complained of the lack of enterprise on the part of local capitalists in refusing to consider such a project, and they seem to have received Mr. Miller with open arms, so to speak. At any rate, his reception was

such that Mr. Miller will likely soon be figuring with the contractors who make gas works apparatus. De Pere is in a similarly-named township of Brown county, Wis., and is on the Fox river (right bank) at a point about 6 miles from its mouth. It is reached by two lines of railway—the Northwestern and the Wisconsin Central—and is 4 miles east of Green Bay and 23 miles northeast of Appleton. On the other or left bank of the river lies the town of West De Pere (both being connected by a fairly good bridge), and the combined population—possibly an aggregate of 5,300—ought to furnish a fairly remunerative field for a gas works.

THEY are still—or at least Mayor Chapman is—peddling that city holding in the stock of the Portland (Me.) Gas Light Company. It will be remembered that the highest bidder in the competition of two months ago was the firm of Messrs. H. M. Payson & Co. (by the way, these gentlemen act as financial agents for the American Water Works and Guarantee Company), who offered $95.50 per share for the 1,700 shares—par value, $50 each. Among the bidders was the Portland Savings Bank, which offered $90 per share for one-half the block. Shortly after the bids were opened and referred back to the Mayor's special committee, a second special committee, that had been appointed to inquire into the financial standing of the Gas Company, presented a report on the matter. Its facts were so pointed in showing the solvency and stability of the Company that even Mayor Chapman seemed disinclined to get rid of the stock, thus once more giving evidence of the ease with which he can ride over and into ordinary commercial laws and rules. And we think most business men will agree with us in the idea that Messrs. Payson & Co. would have a pretty good case in law if they wished to test the virtue of the Mayor's May action in court. The torridity of the late June days seems to have caused the Mayor to again become rabid on the subject of the gas stock, for we notice that about July 1 he sent a communication to the Council stating that the Portland Savings Bank had made an offer of $100 per share for the city's holdings in the Gas Company, the offer being based on the ground "that the report of the special committee of the City Council on the condition of the Gas Company's affairs is correct." The Bank's offer, as conveyed by the Mayor, was referred to another special committee; and there the matter rests, as far as we know. We hope that the Bank's last proposition will be accepted, for in such event we imagine Mayor Chapman and the city will be called into court to answer a suit the foundation of which will rest on the boldest sort of a breach of good faith. The Messrs. Payson represent a Company which by its honorable dealing has won golden opinion from those who at any time had occasion to transact business with it.

BOSTON, Mass., expended last year, in its public lighting, the sum of $548,714, of which amount her 10,157 gas lamps absorbed $340,867; oil lamps took up $42,131; and arc lighting absorbed $136,893. The balance is taken up in various ways connected with the supervision, inspection, etc., of the system. Most of the arc lighting is paid for at the rate of 65 cents per light per night; and that Honorable reformer, Mr. O'Brien, does not think the rate too high. Boston people (at least some of them) are said to understand the reason for his opinion in this instance.

WE understand that the promoters of the Norfolk (Va.) Fuel and Gas Light Company, the incorporation of which was chronicled by us some months ago, are about to begin construction work. Mr. T. J. Hayward and Engineer Hambleton, of the Consolidated Gas Light Company, Baltimore, Md., visited Norfolk last month for the purpose of looking up and deciding upon an eligible site for the proposed plant, and we believe that a plot of land has since been secured. The Company's officers are: President, Hon. D. Tucker Brooke, of Norfolk; Secretary, Capt. Samuel Kimberly; Treasurer, Daniel Conkling, of Baltimore. It is also said that the capital was raised mainly through the instrumentality of Mr. Edw. Hamilton, of Hamilton & Co., the well-known Baltimore bankers.

THE Milwaukee (Wis.) authorities have closed a contract for the public lighting of the city with the Gas Company. Under its terms the Company agrees to maintain, light, extinguish, etc., gas lamps fitted with 6-ft. burners, at the rate of $27.60 per annum; 5-ft. burners to be paid for at the rate of $24.17. Gas is to be furnished to public buildings at the net rate of 90 cents per 1,000 cu. ft. Bills are to be paid at the expiration of each quarter, in default of which the city is to pay 7 per cent. interest on accounts unsettled within the time named in the contract. Burning hours commence 30 minutes after sundown and terminate 50 minutes prior to sunrise. Under the old contract the Company supplied or maintained a total of 2,600 lamps; but the new instrument permits the city at its pleasure to substitute electric light for a certain number of gas lamps, provided, however, that at no time within the life of the contract shall the number of gas lamps maintained be less than 2,000. The Milwaukee Company is seriously considering the possibilities of fuel gas manufacture and distribution.

PRESIDENT CRESSLER HEARD FROM.—President Cressler still adheres to his original style of passing away the dog days. Here are some of his latest contracts: Single-lift holder (45 ft. diameter by 16 ft. deep) for the Washington (O.) Court House Company; ditto (49 ft. by 27 ft. 6 in.), at Kansas City (Mo.) Company's works; again (50 ft. by 16 ft.), for the Paris (Texas) Gas and Electric Light Company; a telescopic holder (outer section, 110 ft. diameter, inner section, 108 ft. 6 ins. diameter, lifts, 28 ft.), with lattice columns and girders, and 20-inch tank connections) to the order of the Omaha (Neb.) Gas Manufacturing Company; and new benches of 5's for the Washington (Ind.) Company. In addition to the above President Cressler's Company will rebuild the Canton (O.) Company's plant, raising the scale of the works from 6 to 8-inch. The construction items embrace a new retort house roof, horizontal boiler, two benches of 6's, rotary exhauster, a 40-inch by 25-ft. washer, four purifiers, 8 ft. by 10 ft., by 3 ft. deep, and a 6-ft. station meter. Fort Wayne evidently intends to keep up its reputation as a manufacturing center, and the head center of the Kerr Murray Manufacturing Company means to do his part toward that end.

WE are indebted to one who knew him well for the following memoir on the late Mr. Aaron Thompson, whose demise was recorded in our last issue: "To the Editor AMERICAN GAS LIGHT JOURNAL:—Woburn, Mass., July 4, 1888.—Aaron Thompson, who for 32 years was Superintendent of the Woburn Gas Light Company, died at his home in this city, on June 18. Deceased was born in Peacham, Vt., December 9, 1817, and was therefore in his 72d year. At an early age he went to Charlton, Mass., and there learned the trade of shoemaker. He subsequently went to Maryland, and drove a stage westerly from Frederick City, but soon returned to Charlton. His stay in Charlton was brief, having, in 1840, decided to visit Woburn, where he worked at his trade for some time, or until he secured the position of lock tender on the Middlesex canal. These duties were performed by him until the Woburn branch of the Lowell Railroad was opened for business, at which time he assumed the duties of Depot Master and Ticket Agent in this place. In fact he had complete charge of the Company's Woburn interests. In 1855, when the Woburn Gas Light Company was organized, Mr. Thompson was elected its Treasurer and Superintendent, which dual position he held until about a year ago, when he peremptorily declined to longer serve the Company. Failing health was the cause of his refusal to remain in harness. During his period of office, which meant a service of over 32 years, he was never asked to give a bond, although he handled all the moneys of the Company. Mr. Thompson ever had the interest of his Company at heart. He was an honest, upright citizen, respected by every one who ever knew him.—J. G."

ANOTHER VERDICT.—No matter what or how ridiculous is the claim urged by the plaintiff who brings suit against a gas company—and this is especially so when the preliminary or jury stage of the case is in progress—the plaintiff is measurably certain to have respectful and substantial recognition given to his whinings or palterings with the truth. The latest illustration of this is afforded by the verdict of the jury which "considered" the case of D. S. Stombs against the St. Paul (Minn.) Gas Light Company. Last winter Stombs received injuries because of an accidental explosion of gas that had escaped into a vault near the corner of 6th and Rosabel streets, the leakage being due to a fractured street main of the Gas Company. His injuries were not of a particularly painful nature (and it is by no means clear that his ignorant action was not partly responsible therefor), but he sued the Company for a $10,000 plaster wherewith to blot out the remembrance of the "terrible day." The case was tried before Judge Wilkin and a jury, and the intelligent 12 thought that $7,000 would compensate Stombs. There is no doubt that the compensation is ample as to sum; but, judging from the evidence, $70 would have been by far too great. However, he may not get that yet, for the case has been appealed.

THE Newark (N. J.) Gas Light Company has declared its regular quarterly dividend of 2½ per cent.

CAPT. WHITE is under contract to build, for the Middletown (N. Y.) Gas and Electric Light Company, a non-trussed, wrought iron column, single-lift gasholder (72 feet diameter and 20 feet deep), the same to have 10-inch connections. The Stacey Manufacturing Company will supply the iron work. Another contract in which he is interested is at St. Paul,

Minn. The Gas Company at this point has arranged to substitute an elegant, roomy, single retort house for the two structures now on the plant. The new structure will at first house 4 benches of 9's, to be fired under the McIlhenny improved system; but it is intended hereafter to largely increase that number of settings. The house is planned with that end in view.

Obituary Note.—Isaac Stebbins.

We are indebted to Mr. J. Andrew, Superintendent of the Chelsea (Mass.) Gas Light Company, for the following particulars concerning the life of the late Hon. Isaac Stebbins, who had been President of the Chelsea Company since the date of its organization in 1852:

After a year of failing health and several weeks of sickness, confining him to his home, Hon. Isaac Stebbins died at his residence on Franklin avenue in this city on Thursday, June 21. Mr. Stebbins was born at Stamford, Conn., October 3, 1817. Both parents died when he was very young, and he was left to fight the battle of life unaided. Being endowed with good physical and mental powers, he bravely endured the privations and hardships of early childhood, and, avoiding the temptations and follies of youth, entered upon manhood with a determination to win honorable success in life. He came to Boston when a mere lad of 15 years, and engaged in the fruit business with but two dollars capital. He succeeded in the venture and, with remarkable energy, industry and foresight, won his way from poverty to affluence. He became a citizen, about 1842, and soon made himself an important factor in developing the material interests of the community. He became superintendent of streets and manifested a remarkable faculty in improving them. He has ever since been identified with the growth and prosperity of the town of his adoption and since it became a city. He was for several years chairman of its board of selectmen, and represented the city in the General Court during the years 1874 and 1875, where he did active and effective service in important legislation, taking especial interest in the act passed in 1875 to regulate and limit municipal indebtedness. In 1877, upon his return from a season of travel in foreign countries, he was made Mayor of the city by an almost unanimous vote of his fellow citizens, and was again elected in 1878 by the same unanimity. His administration of the affairs of the city, as its chief magistrate, was characterized by the same ability which has always won him success in almost every undertaking. He was conspicuous in the notable contest in 1878, in which Chelsea was successful in throwing upon the city of Boston the maintenance, forever, of that part of Chelsea bridge lying within the limits of Boston, which the city of Chelsea had been so unjustly compelled by law to maintain for many years. He occupied other places of trust and confidence among the people with whom he had lived for nearly half a century. His business qualifications and habits were excellent, and based upon sturdy integrity. His judgment was practical and sound, his decision prompt, and punctuality in all his business engagements was his invariable rule. In the accumulation of property he made a success and became the owner of quite a number of houses and stores which were always kept in first rate repair, the tenants of which all say that Mr. Stebbins was the "best landlord ever in Chelsea." Among the many enterprises with which he was connected, and public trusts which he held, he was, at the time of his death, president of the First National Bank, an institution originally founded by him as the Tradesman's Bank, 38 years ago, during which time he has continuously been its first officer; president of the Chelsea Gas Light Company from its organization in the year 1852, and was one of the original incorporators and the chief promoter of the enterprise; president of the Globe Gas Light Company; president of the Suffolk Cordage Company, an extensive enterprise recently established; a director of the Winnisimmet Company, among the oldest corporations on this continent; and a director in the Lynn and Boston Railroad Company, of which he had been president in its earlier years, and which road he built under many discouragements, and with great energy and ability he maintained until it became a successful and valuable property. As proprietor of the Academy of Music, he provided the city with an attractive place of amusement and intellectual entertainment.

Mr. Stebbins was for many years an official and prominent member of the Universalist Church, and took an active and generous interest in its affairs until ill health compelled him to relinquish some of his many cares. Whatever he undertook to do, he did well, and his advice was always safe to follow. No enterprise with which he was identified failed, and he always paid 100 cents on a dollar and had a margin left on that. Some people who did not know him may have thought him lacking in geniality, as to strangers he was a man of few words. But, really, he was always easily approachable to those in humble circumstances, who invariably received most kind and considerate treatment at his hands; and meritorious youth often found him in him a ready and staunch patron.

Early in life Mr. Stebbins married a Miss Mary A. Stewart, daughter of Dr. Adam Stewart, a Roxbury physician. For nearly half a century she has been to him a devoted and faithful wife, and the happy family circle, consisting of the parents and three daughters, Mrs. Elder of Arizona, Mrs. Gilbert, wife of Dr. Daniel D. Gilbert, of Boston, and Mrs. Slack of this city, has never been broken until this sad affliction. In this sorrowful bereavement many intimate friends, a wide circle of business associates, and the community at large, will deeply sympathize. At the age of 71 years, death has closed the earthly career of a kind and indulgent husband and father, a steadfast friend, a wise councellor, a public spirited citizen and an upright and honorable man.

In the above no attempt has been made to analyze the character of Mr. Stebbins, other than in his business relations with his fellow men and as a factor in the material development of Chelsea, as also of some of his more special characteristics as a representative citizen. No doubt the impress of his character and acts will long be felt among the people of Chelsea.

New Apparatus for Filling Gas Balloons.

A German authority (*Kuhlow's Trade Review*) says, in respect of this topic, that a short time ago some experiments were conducted in Furstenwalde in the presence of many distinguished spectators with an apparatus for filling gas balloons. The new system promises to prove of special value to military ballooning, for which it is primarily intended, though applicable to other purposes. The value of aerial navigation in war time and under certain conditions is recognized by all. Its general introduction, however, has hitherto been attended by difficulties. To fill a balloon with coal gas is practically impossible in the field; so that hydrogen must be employed. Hydrogen has hitherto been produced by passing water as steam over glowing iron, or by decomposing a solution of sulphuric acid with iron or zinc. The former of these processes can only be carried out by experienced workmen, and necessitates the transport of large quantities of iron. The apparatus, moreover, is on such a large scale as to be almost too unwieldly for use. The second method also has its defects. In order to fill a balloon of 500 cbm., about 2,000 kg. of zinc, 4,500 kg. of sulphuric acid and 39,000 litres of water (partially for mixing with the sulphuric acid and partially for cooling) are required. This large quantity of sulphuric acid is cumbrous and dangerous to transport, the requisite water can only be obtained during war time in exceptional cases, and as the sulphuric acid of commerce contains a large percentage of arsenical impurities, the gas evolved contains as a rule so much arseniuretted hydrogen as to be poisonous, and many deaths have actually taken place in consequence. The new apparatus, invented by Majert and Richter, obviates these disadvantages. The hydrogen is produced by red-heating a mixture of slaked lime and zinc dust. The heat separates the water from the lime, the water being decomposed by contact with the zinc, giving off pure hydrogen. The mixture consists of a dry powder, which can be placed in tin boxes and is easily transportable. The gas evolved is free of poison and acids, and can harm neither the stuff of which the balloon is made, nor the ballooning party. The retort looks like a small portable engine. It is mounted on a gun carriage and can be easily drawn by four horses. In front is a seat for two drivers, which is screwed off when the operation is to begin and a chimney substituted. These preparations last one minute. The fire is then lighted, and in six minutes the pipes which receive the powder are red hot. The powder is then placed on the pipes, and five minutes later hydrogen gas is being regularly given off. When 120 boxes of powder are utilized, about 120 cbm. of gas will be given off per hour, so that in three hours a moderately sized balloon can be filled. The experiments at Furstenwalde answered every expectation. We understand that several governments are interesting themselves in the new process.

Solidifying Petroleum.—Dr. Kauffmann, who has been experimenting (at the instance of the Russian Government) on a means of solidifying petroleum, so that the use of the latter as a fuel may be rendered more economical and cleanly, reports that a successful method of accomplishing the desired result consists simply in heating the oil and afterwards adding from 1 to 3 per cent. of soap. The latter dissolves in the oil, and the liquid, on cooling, forms a mass having the appearance of cement and the hardness of compact tallow. The product is hard to light, burns slowly and without smoke, but develops much heat, and leaves about 2 per cent. of a hard, black residuum.

THE AMERICAN GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,
PROPRIETORS.

Editor—JOS. R. THOMAS, C.E.
Asst. Editor—T. J. CUNNINGHAM
Manager—C. E. SANDERSON.

PUBLISHED ON THE 2ND AND 16TH OF EACH MONTH
At No. 42 Pine Street, New York.

TERMS:
SUBSCRIPTION—Three Dollars per annum, in advance.

MONDAY, JULY 16, 1888.

Testimonial to the Late Mr. Richardson.

The Board of Directors of the Wilmington (Del.) Coal Gas Light Company recently adopted the following testimonial as to the worth of their former colleague, Mr. George Richardson, notice of whose death has already been given to our readers: "OFFICE WILMINGTON COAL GAS COMPANY, July 3, 1888.—When death takes from a community one who has through a long life taken an active and conspicuous part in its affairs, it is becoming and proper that the corporations which have had the benefit of long, faithful and valuable services should record their estimate of such worth.

"George Richardson, late President of this Company, departed this life on the 23d of June last, after a service of nearly 35 years as one of its directors, during all but 11 years of which he filled most acceptably the position of its President.

"He was honest, faithful and true to its best interests, and while performing his whole duty to the Company and its patrons, was uniformly kind, courteous and considerate to the members of the Board, as well as to all of its employees.

"In the death of such a man the whole community suffers loss, and we deem it a duty to spread upon our minutes this remembrance of our heartfelt sorrow and regret.

"To his devoted family we can only offer our tender sympathy in their great bereavement, assuring them that he leaves behind him an unsullied reputation that is more valuable than wealth and more lasting than power.

"The Secretary is hereby directed to send a copy of this minute to his family, and to insert it in our daily papers.

"By order of the Board of Directors.

"WM. P. TAYLOR, Secy."

The Market for Gas Securities.

The city market is about as dull as can be, save that the reigning inactivity is reported at higher figures. There is but little Consolidated stock offering, which is not surprising when one remembers that people who are receiving a 4 per cent. certain return on the par of their holdings are not likely to part with the latter at current Wall street rates. The Consolidated Company's position improves daily, and the time will surely come when its entire capital stock will be represented or covered in the value of its real estate holdings. We expect that this assertion will be received in many quarters with pitying smiles; but the doubters, if they so desire, can by means of simple inspection, convince themselves that we are not very wide of the mark. To-day (July 14) Consolidated is bid for at 73½, sellers holding out for a half point higher. Equitable has moved up sharply, an advance of 5 points being recorded in the fortnight. Mutual is rather weaker, with no apparent reason for the unsteadiness. Central is also somewhat lower. At auction, last week, the following sales in Brooklyn shares were made: $1,500 Nassau scrip at 99; 100 shares Nassau at 105½; and 160 shares old Brooklyn, at 103½. At the same time the following "miscellaneous" gas "securities" changed hands: $5,500 Peoples Gas Light Company, Westchester, N. Y., 6 per cent. first mortgage bonds, at $475 for the lot, and $6,000 Corsicana (Texas) Gas Light Company, 7 per cent. bonds, at $300 for the lot. Brooklyn shares are somewhat stronger, and there is a fair inquiry for them. Chicago Trusts are weaker, and Consolidated, of Baltimore, is a trifle higher. Eastern shares are very firmly held, and we note that Treasurer Harbison, of the Hartford (Conn.) Company has been sending the regular quarterly dividend checks to his shareholders. Eastern capital is being attracted in considerable volume to southern gas enterprises, one very important transaction in this respect having been made some time ago by Mr. D. D. Withers, of this city, in his purchase of a large holding in the New Orleans (La.) Company. When a shrewd capitalist like the ex-President of the East River Ferry Company takes such a step, perhaps others might find it profitable to follow a similar course. And it is an open secret that many Southern cities and towns offer good chances for those inclined to gas investments.

Gas Stocks.

Quotations by Geo. W. Close, Broker and Dealer in Gas Stocks.

16 WALL ST., NEW YORK CITY.

JULY 16.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share.

	Capital.	Par.	Bid	Asked
Consolidated	$35,430,000	100	73½	74
Central	440,000	50	—	60
" Scrip	220,000	—	47	57
Equitable	4,000,000	100	110	112
" Bonds	1,000,000	—	113	115
Harlem, Bonds	170,000	—	—	—
Metropolitan, Bonds	658,000	—	115	118
Mutual	3,500,000	100	90	92
" Bonds	1,500,000	1000	101	103
Municipal, Bonds	750,000		—	—
Northern	125,000	50	30	—
" Scrip	108,000			
Yonkers		50	—	80
Richmond Co., S. I.	300,000	50	55	60
" Bonds	12,000	—	—	—
Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	102	105
Citizens	1,200,000	20	50	55x
" S. F. Bonds	320,000	1000	—	103
Fulton Municipal	3,000,000	100	133	135
" Bonds	300,000		—	106
Peoples	1,000,000	10	70	72x
" Bonds (5's)	368,000	—	97	—
" " (6's)	94,000	—	100	—
Metropolitan	1,000,000	100	80	82
Nassau	1,000,000	25	102	105
" Ctfs	700,000	1000	98	100
Williamsburgh	1,000,000	50	122	125
" Bonds	1,000,000	—	111	112
Out of Town Gas Companies.				
Boston (Mass.) Gas Co	2,500,000	500	200	—
Buffalo Mutual, N. Y.	750,000	100	90	95
" Bonds	200,000	1000	95	100
Citizens, Newark	1,000,000	50	208	215
" " Bonds	45,000	—	—	—
Chicago Gas Trust	25,000,000	100	29¾	30¼
Cincinnati G. & C. Co.	6,000,000	100	179	180
Consumers Toronto	1,000,000	50	192	—
Central, S. F., Cal.			—	84
Capital, Sacramento, Cal.			58	—
Consolidated, Balt.	11,000,000	100	45	—
" Bonds	6,400,000		107	107½
Hartford, Conn	750,000	25	—	138
Jersey City	750,000	20	165	170
Laclede, St. Louis, Mo.	2,000,000	100	118	122
Louisville, Ky	2,570,000	50	125	130
Little Falls, N. Y.	50,000	100	—	100
" Bonds	25,000	—	100	103
Montreal, Canada	2,000,000	100	210	214
Memphis (Tenn.) Gas	750,000	100	48	51
" Bonds	240,000	100	103	—
New Haven, Conn		25	193	197
Oakland, Cal.			32½	33½
Peoples, Jersey City		—	60	61
" " Bonds			—	—
Paterson, N. J.		25	90	—
Rochester, N. Y.		50	75	80
Syracuse, N. Y.	500,000	25	—	—
St. Louis, Missouri	600,000	50	—	—
San Francisco Gas Co.				
San Francisco, Cal.	10,000,000	100	57	58
Washington, D. C.	2,000,000	20	200	201
Wilmington, Del.		50	200	208
Havana (Cuba) Gas Co.	3,000,000	100	18	20
" Bonds	550,000		102	—

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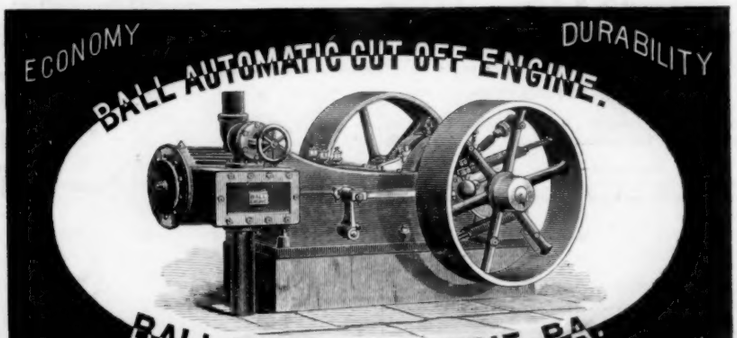

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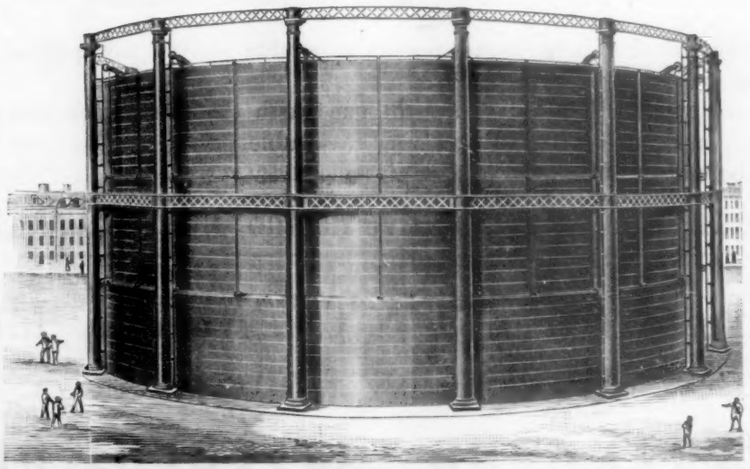

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Gas Works Designed and Constructed.

To All Whom It May Concern!

The SIEMENS-LUNGREN COMPANY hereby warns the public against the use of various infringing Regenerative Gas Lamps which are offered for sale. This Company has heretofore delayed bringing suit to enjoin the manufacture or importation of such infringing lamps, solely because of the practical worthlessness of the infringing devices; and although, in each instance, they infringe some one or more of the various patents owned or controlled by this Company, they have fallen into disuse sooner than any suit could be brought to a hearing. As, however, the introduction of these infringing lamps has tended to discredit the practicability of our Company's system of regenerative gas lighting, we have instructed our Attorneys, Messrs. Geo. Harding, C. S. Whitman, and Silas W. Pettit, to give notice that legal proceedings will in future be taken against all such infringers.

THE SIEMENS-LUNGREN CO., 21st St. & Washington Av., Phila., Pa.

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A very general demand exists, in both large and small Gas Works, for an apparatus that will be absolutely efficient in the removal of the tar which passes the hydraulic main and condenser. Many attempts have been made to accomplish this, but, I believe, without success, until the introduction, five years ago, in England, of the C. & W. Walker Patent Tar and Carbonic Acid Extractor. During these years this apparatus has been adopted by many of the most prominent Engineers, not only in England, but also on the Continent of Europe and in other parts of the world. It is only necessary to give here a partial list in order to convince any intelligent American Gas Engineer that this machine must have succeeded fully in accomplishing the desired results.

The following Engineers have personally given permission to refer to them:

G. C. Trewby, Esq., Engineer-in-Chief of the Gas Light and Coke Co., London. The manufacturing plant at Beckton is built in complete sections of 3,000,000 cubic feet capacity each. A Walker Tar Extractor has been fi ted to each one of these sections. This was done after a long and thorough trial on one of its sections. The Tar Extractor has been supplied to other works of the Gas Light and Coke Co., including those of which John Methven, Engineer of the Gas Light and Coke Co. at the Nine Elms Station, is in charge.

Mr. Charles A. Gerdenier, Superintendent of the Bridgeport (Conn.) Gas Light Company, writes as follows, under date of Dec. 3, 1887:

"The C. & W. Walker Tar and Carbonic Acid Extractor has been in operation at these works for the past six weeks, and is an unqualified success. It removes every particle of Tar from the gas in once passing through the apparatus and a large percentage of the Carbonic Acid. I also feel quite sure that it prevents the formation and deposit of Naphthaline, because since I started the Washer I have had no stoppages from this cause. These works have been seriously troubled with Tar for many years, and I have used several kinds of apparatus and every expedient which has come to my attention for dealing with the difficulty, but without success. The Walker apparatus occupies comparatively small space, is less expensive than other systems, and requires but little attention. I carry 2½-inch seal, and have an automatic tar delivery valve. This Tar Extractor is indispensable to gas makers."

I have taken the Agency for the United States for this apparatus, and am now prepared to make contracts to erect it on the premises of any Gas Company.

This Tar Extractor will perform its work with about one-fourth the usual back-pressure heretofore required. It is simple in construction, and can be supplied at a very reasonable price—less than any other ever before introduced. Satisfactory results will be guaranteed in every instance.

GEO. SHEPARD PAGE, Sole Representative for the U. S., 69 WALL STREET, N. Y.

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PATENT "STANDARD" WASHER-SCRUBBERS.

Following are extracts from letters received from some of the Gas Light Companies now using the "Standard" Washer-Scrubber:

OFFICE PITTSBURGH GAS CO., Sept. 1, 1887.

GEO. SHEPARD PAGE, ESQ.:

Dear Sir—Replying to yours, the "Standard" Washer-Scrubber at these works is giving good satisfaction, and by its use the income from our ammoniacal liquor has been increased 50 per cent. Yours respectfully,

JOHN H. McELROY, Engineer.

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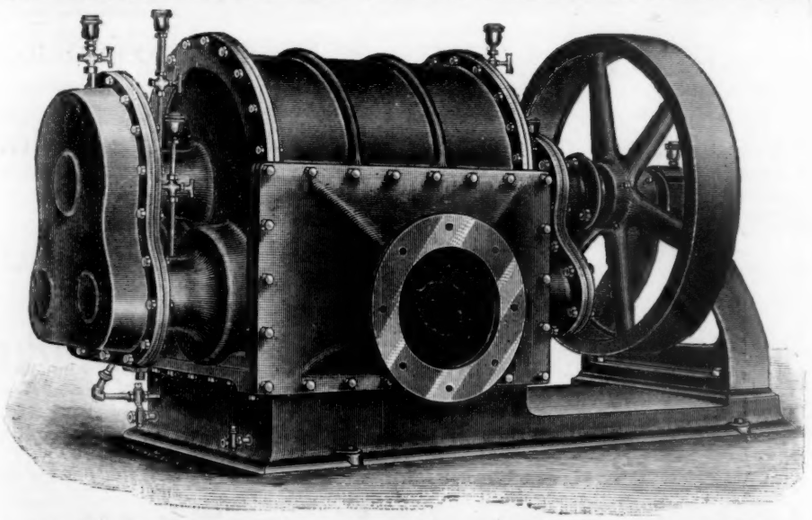

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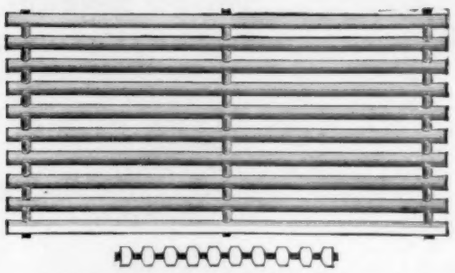

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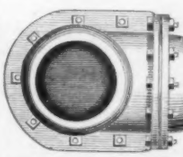

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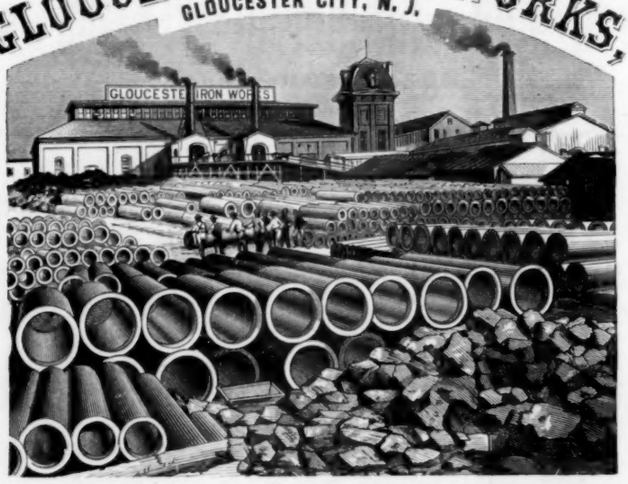

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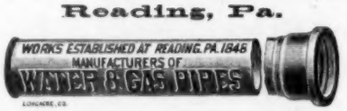

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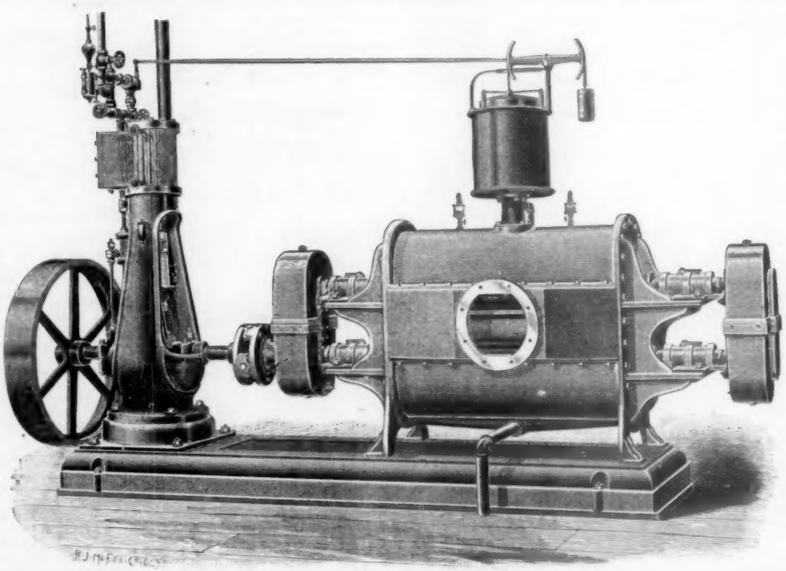

[This Company has recently ordered a larger Exhauster.]

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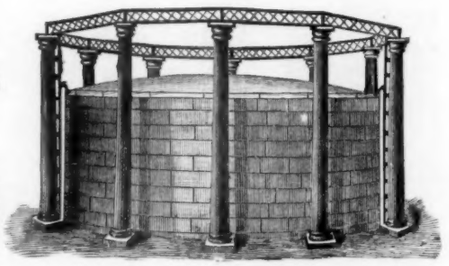

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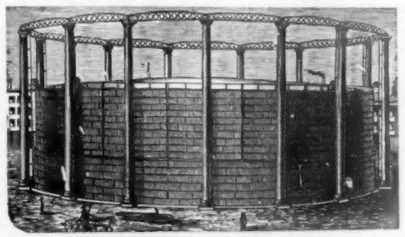

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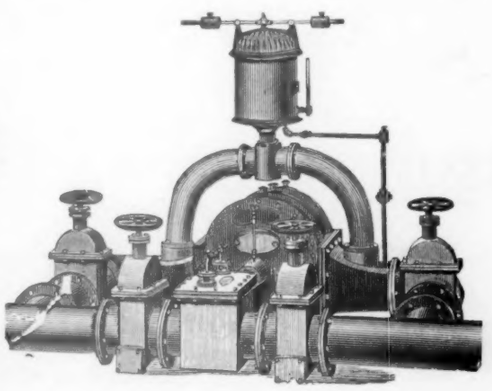

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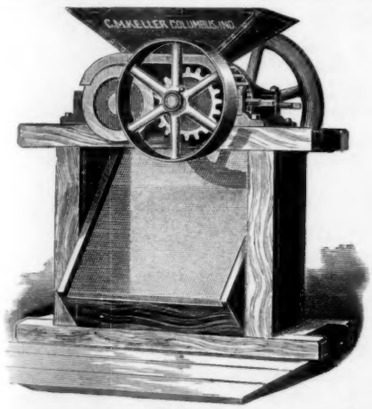

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